

## Hurricane and Severe Storm Sentinel (HS3) Mission

### HS3 2013.09.04-05 Flight Report: GLOBAL HAWK AV-6 mission to P25L/Invest97L

#### Mission Scientists:

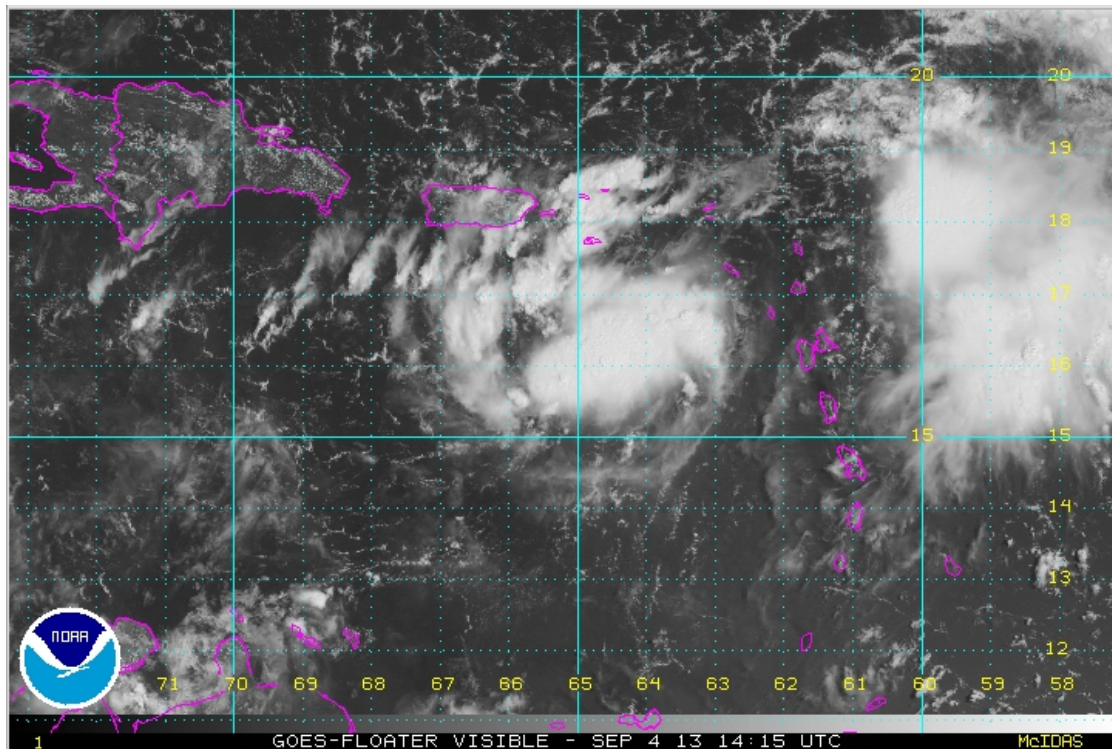
Shift 1 (0800-1700 UT): Scott Braun/Pete Black/Jim Doyle

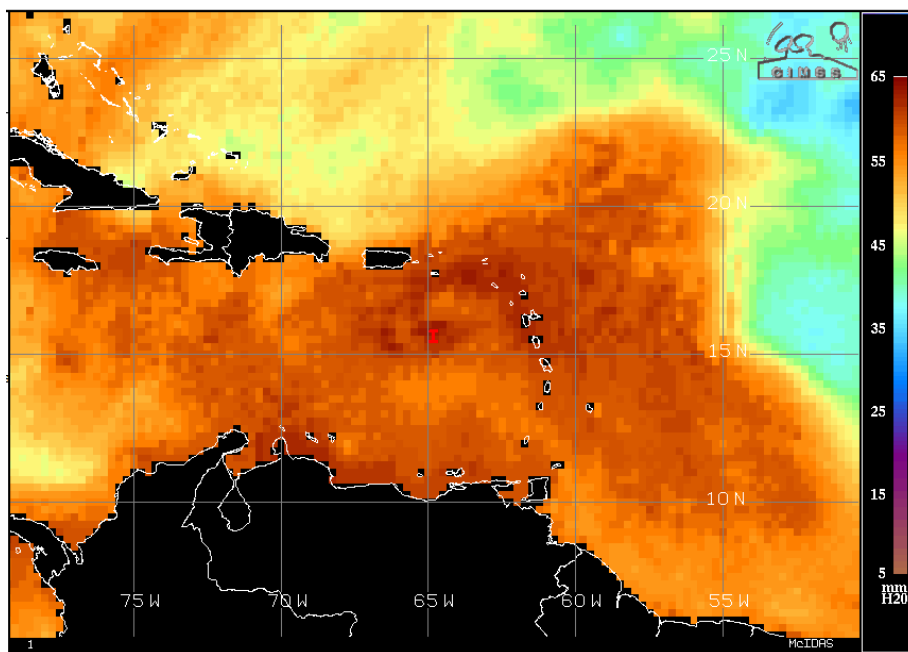
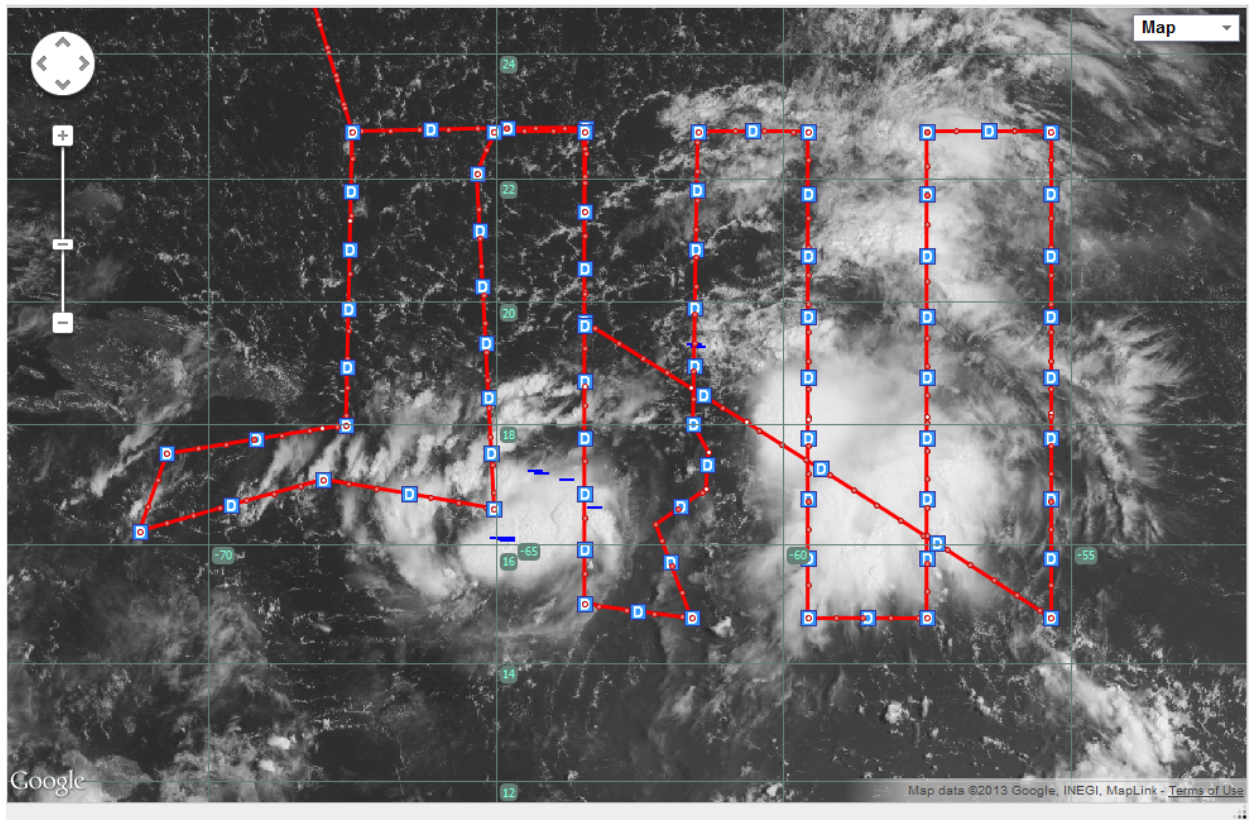
Shift 2 (1600-0100 UT): Jason Sippel/Deanna Hence/Ed Zipser

Shift 3 (0000-0900 UT): Steve Guimond/ Jon Zawislak/Gerry Heymsfield

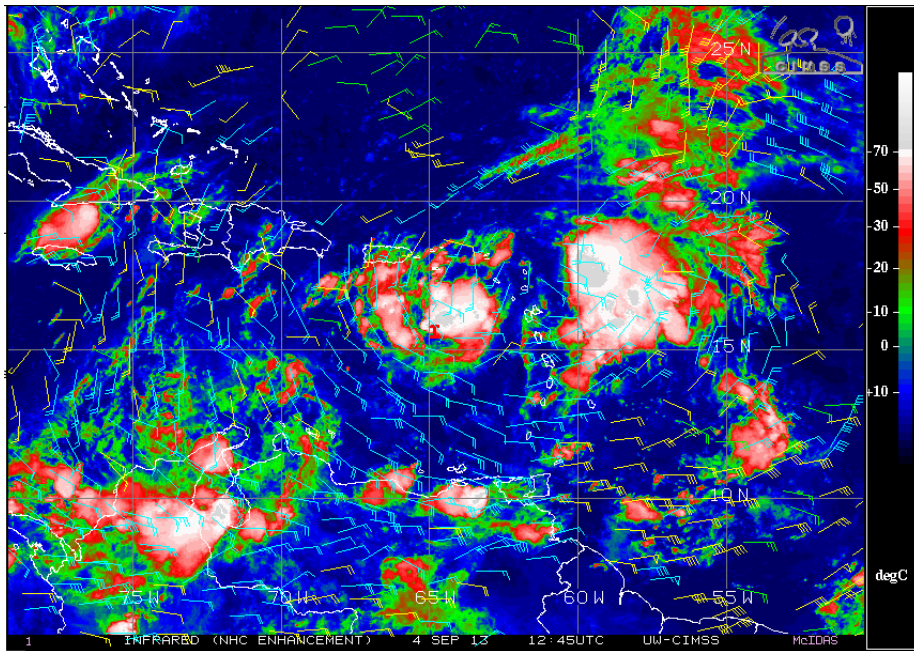
Shift 4 (0800-1200 UT): Scott Braun/ Pete Black/Jim Doyle

Mission goal: This mission is a follow on to an AV-1 flight over P25L and a tropical wave to its east on Sept. 3-4. The goal of this mission is to revisit the P25L disturbance (seen near 65W in the image below) and to sample the environment around the tropical wave near 59-60W. The TPW data (third image below) shows that both disturbances are in high TPW regions and appear to have sufficient protection from dry air. This morning, new convection has erupted on the western side after 0800 UTC with multiple cells extending west to east between 17-18N in the region of the dogleg in the flight pattern (second image). Southerly shear associated with the upper anticyclone is evident with these cells. New convection is also occurring near 65W and is the dominant feature in P25L at takeoff.

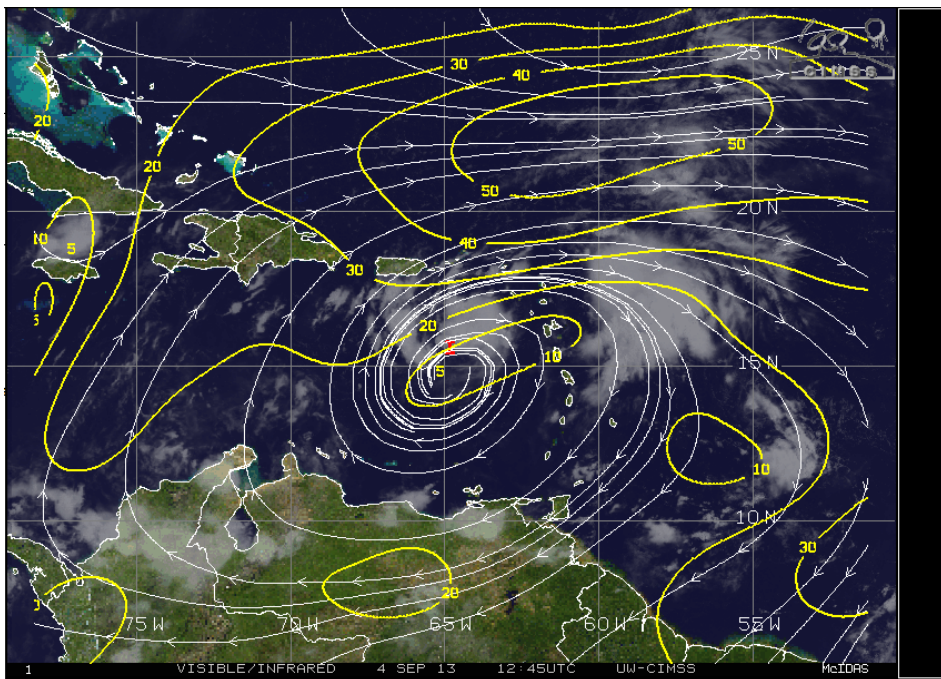








GOES imagery shows the broad upper anticyclone over P25L/I97L and the eastern tropical wave.

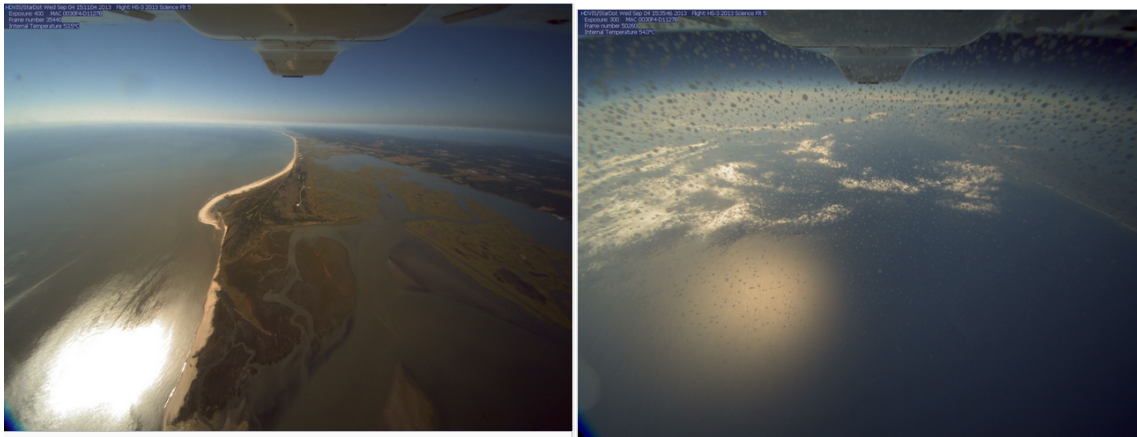


Strong shear on the northern side associated with the persistent westerlies of late and outflow.

1401 UTC Engine start

1502 Taxi start

1509 Takeoff



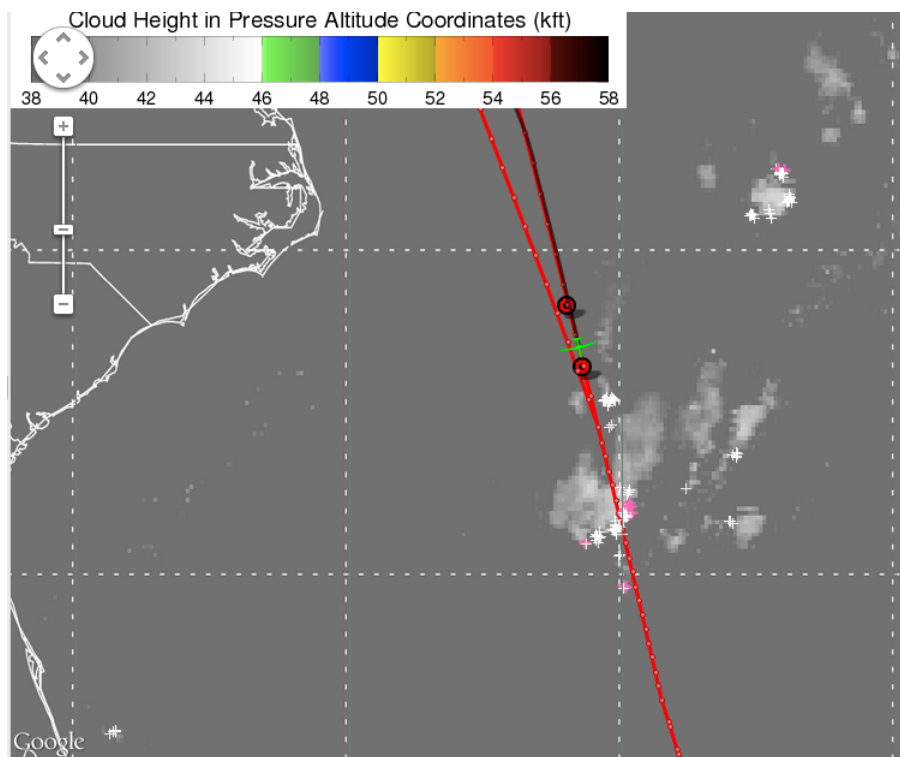
Nice HDVIS image of coast after takeoff. GH crew did 3-h purge this morning. About 30 min later, though, condensation forming again.

1548 CPL reporting that they have power, but not getting lasing data. Recycling power.

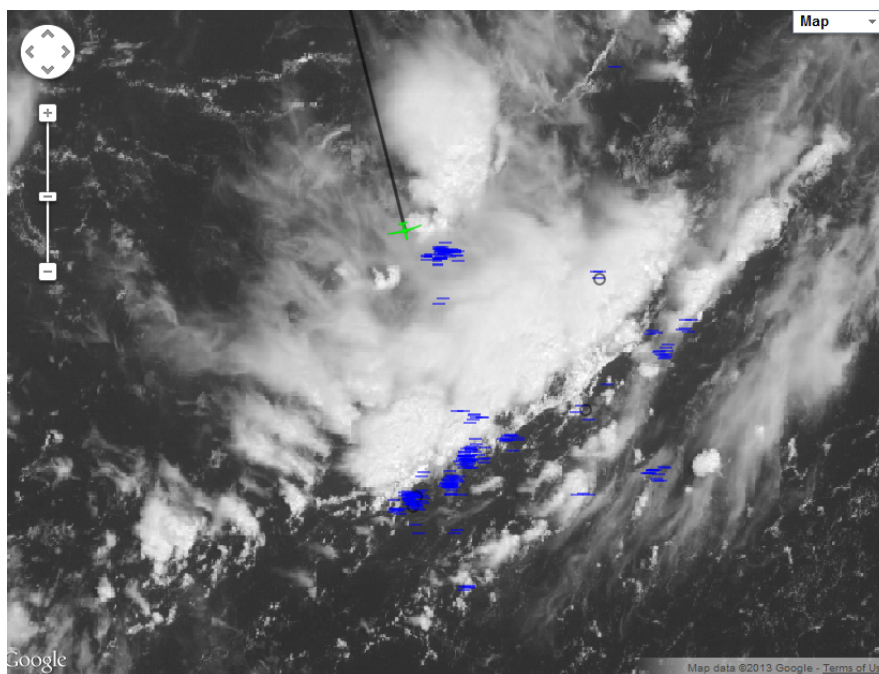
1555 CPL reports they are now getting data.

1605 Leaving W-386

1653 Approaching line of storms with lightning

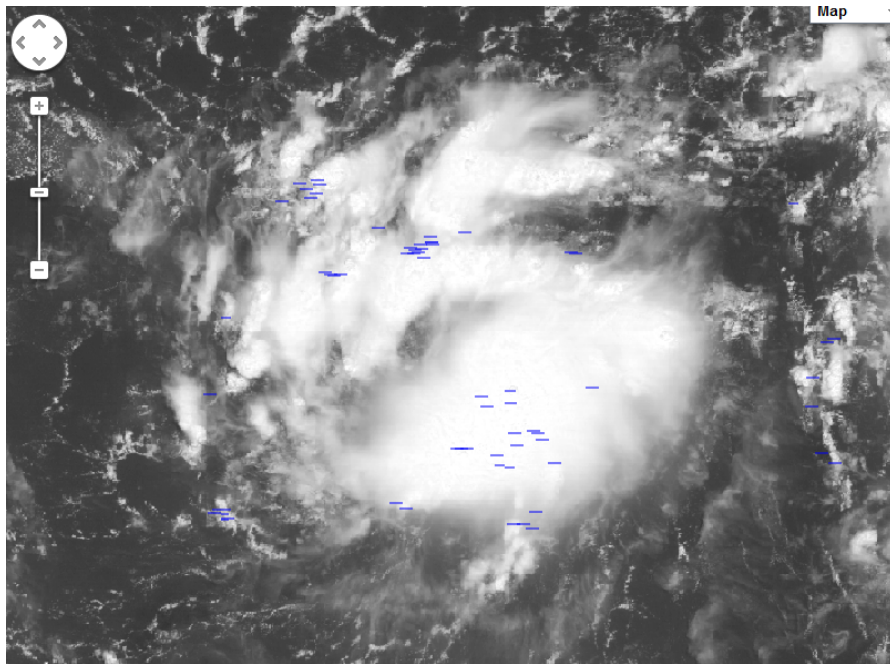


1659 squall line ahead



1705 lightning over 97L

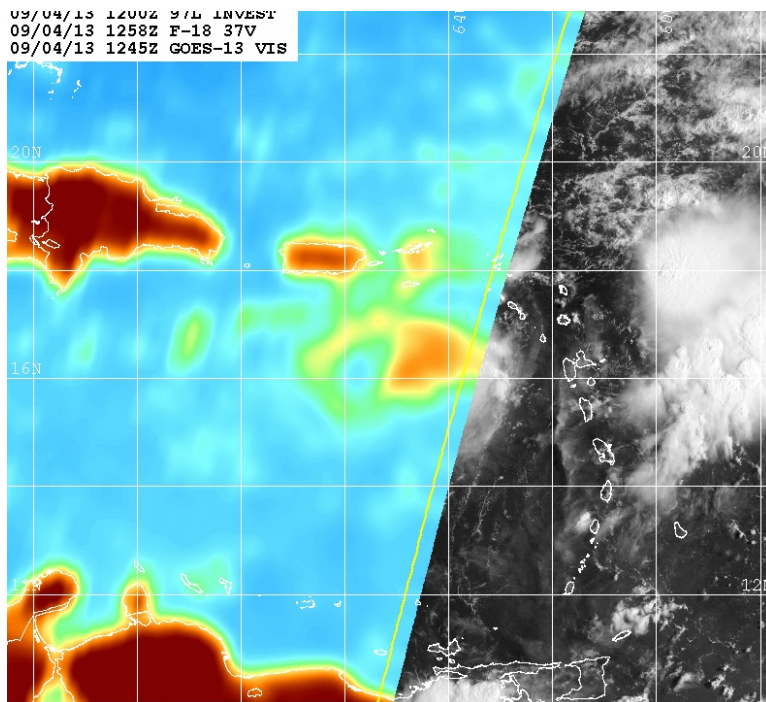




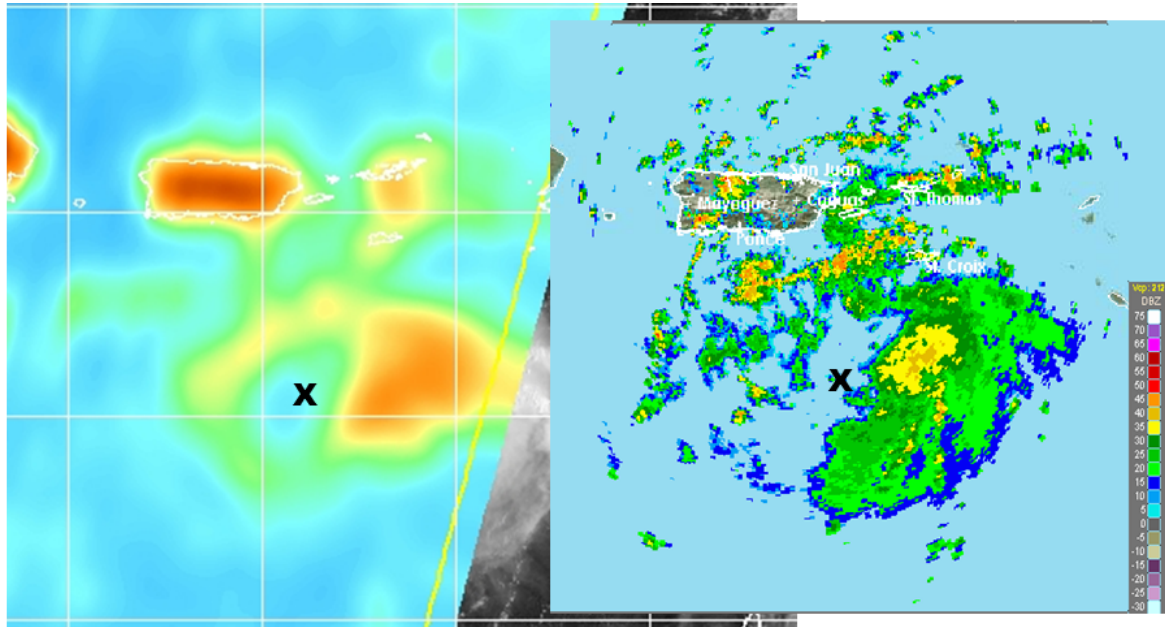
1707 diverting 25 nm W of squall line

1711 53<sup>rd</sup> take-off from St Croix

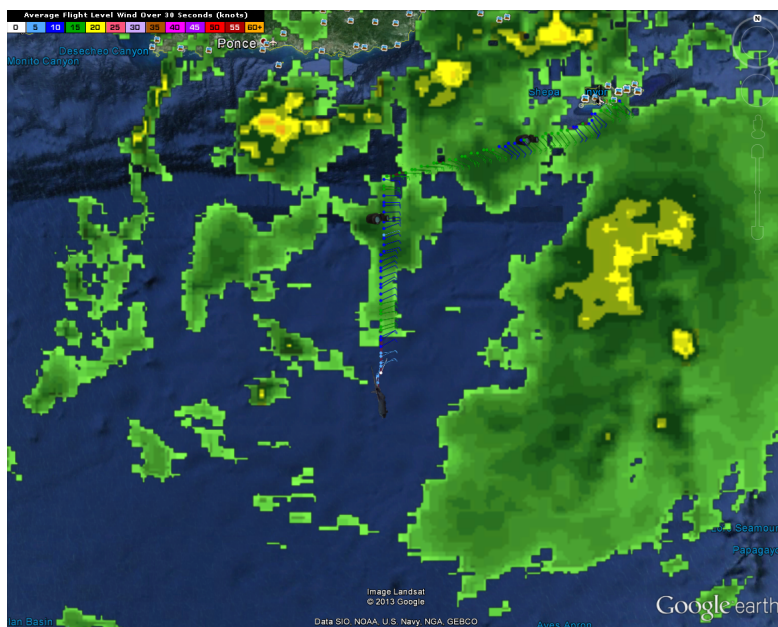
1719 apparent center on SSM/I 37GHz:

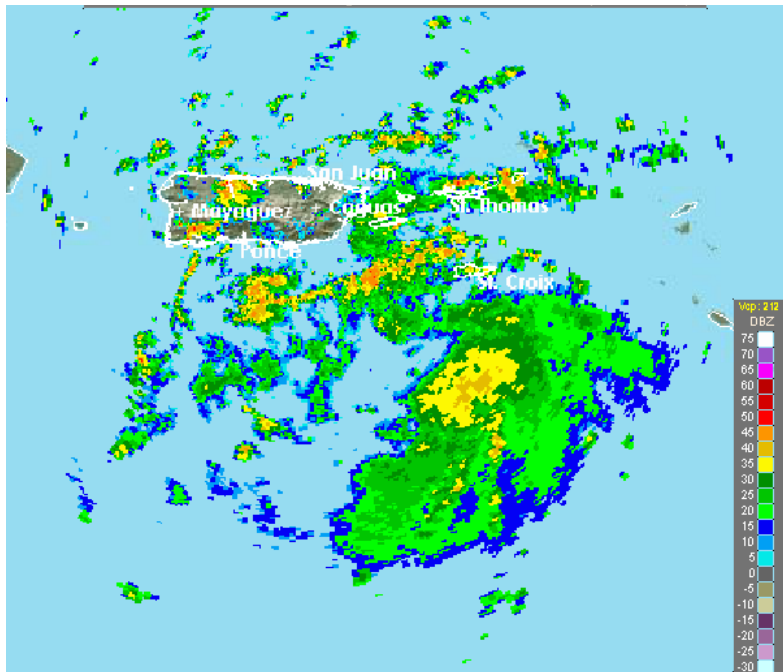


1732 AF recco data from Tropical Atlantic with SJU radar. Animation shows center in same place as SSM/I 37 GHz: 16.2N, 65.7W: 16.2N, 65.9W center from AF 1500 ft FL wind obs

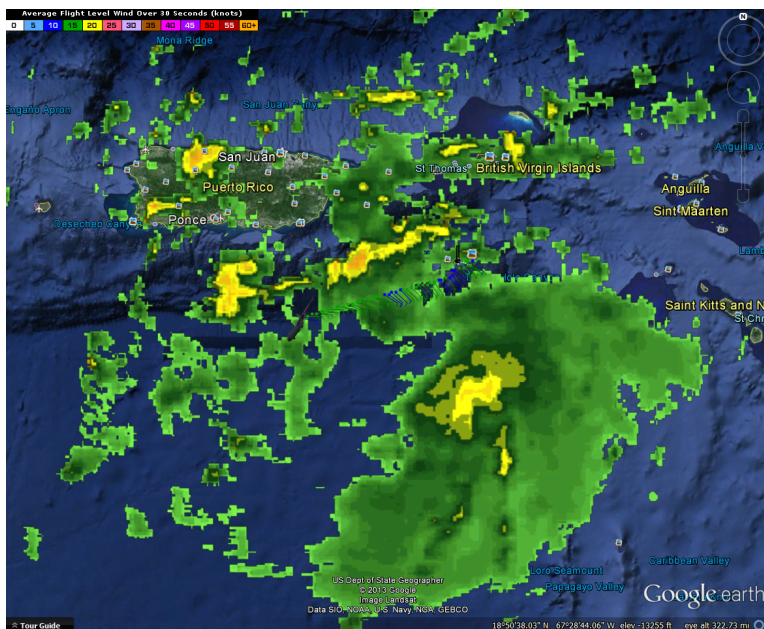


AF/radar below is: 1800Z





1740



1838: Ed Zipser now doing this Mission Scientist report

1841: First sonde in about 20 minutes. Getting ready to hand off to Dryden soon.



1850: Monitoring convection just east of the Mona Passage (west of Puerto Rico) because we need to get through that about 1940 UTC. So far looks OK; lightning nearby in PR but infrequent.

1901: Sonde away. Good data.

1913: D02 good.

1923: D03 good.

1933: D04 good.

1942: D05 good

1948: at 17 N 65.5 W. deep core close to center based on AF C130 winds. Cld top FL 540.

1954: D06 good.

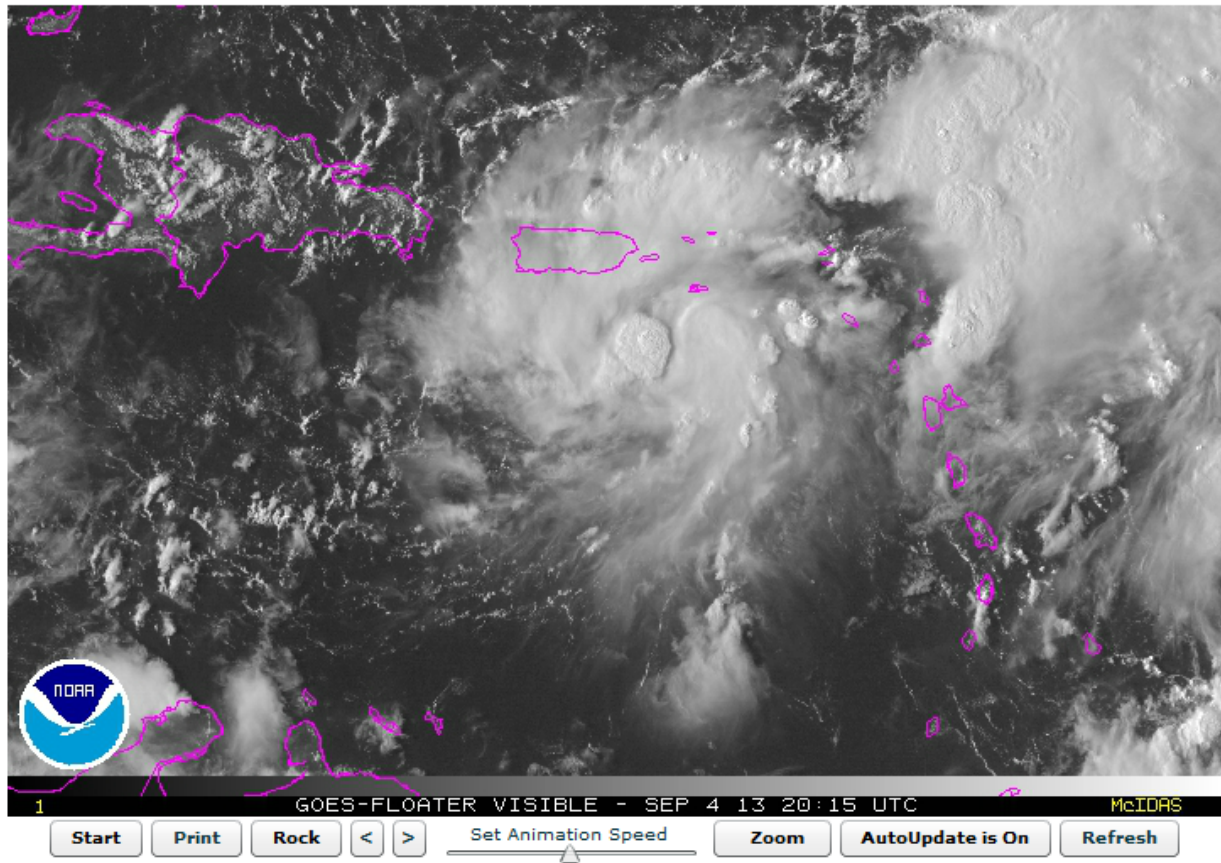
2008: D07 good.

2023: D08 good.

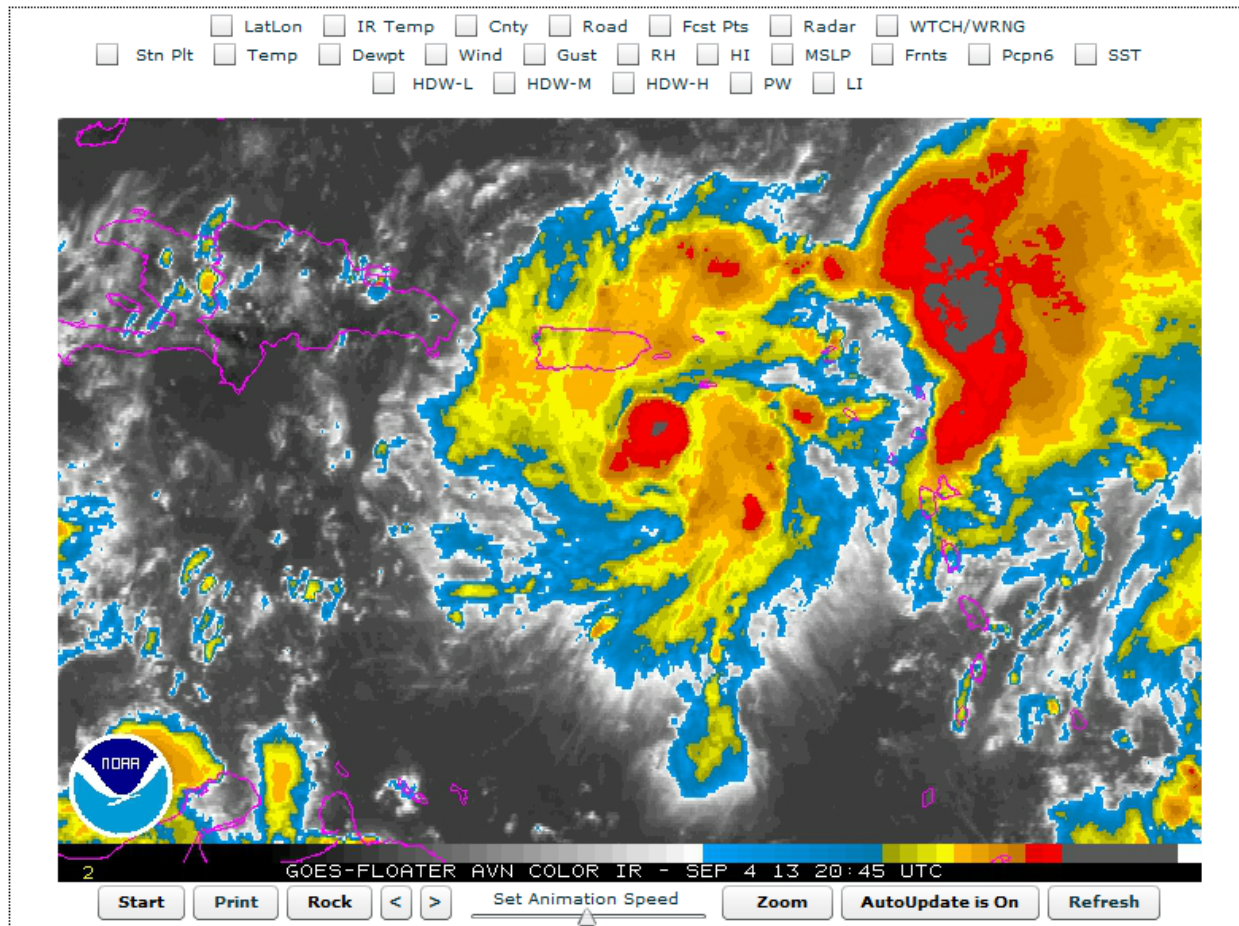
After consultation with Sippel, Hence, and Doyle, sketched out a recommended change in the last half of the flight track; Doyle taking it to the planners to work out new waypoints and drop points. Based upon the evolving satellite data, and the CIMMS upper level winds, we elected to extend some legs farther north and south, while sacrificing resolution in the E-W direction on the east side of the pattern. Working it out. (Note added at 2139: New track OK with Leslie, and Fratello sees no problems, so asked Leslie to work it up and get the updated track plan on MTS. Note added at 2237: one more change- see below)

2034: The track to Drop 13 is too close to a very tall CB close to the cyclone center. Hence and Sippel working with Fratello to move track far enough south to avoid the cell without losing these important drops. Note that the San Juan radar loop shows good rotation centered on this CB, and the Doppler radial winds confirm a pretty significant low level circulation at this location. Also the AF C130 data.

2039: D09 good



Vis image showing the major convective blowup close to the center.



This is the IR image of this apparent center that is rotating quite noticeably on the San Juan Radar.

2055: D10 good

NHC discussion for 5 pm

TROPICAL DEPRESSION SEVEN DISCUSSION NUMBER 1  
 NWS NATIONAL HURRICANE CENTER MIAMI FL AL072013  
 500 PM AST WED SEP 04 2013

AIRCRAFT AND SATELLITE DATA FROM THIS AFTERNOON INDICATE THAT THE LOW PRESSURE SYSTEM SOUTH OF PUERTO RICO HAS JUST ENOUGH OF A CIRCULATION AND ORGANIZED CONVECTION TO BE CONSIDERED A TROPICAL



DEPRESSION. THE INITIAL INTENSITY IS SET TO 30 KT BASED ON A 41  
KT  
FLIGHT-LEVEL WIND FROM THE AIR FORCE PLANE.

THE ENVIRONMENT NEAR THE DEPRESSION APPEARS TO BE CONDUCTIVE FOR  
STRENGTHENING DURING THE NEXT DAY OR SO WHILE IT REMAINS FAR  
ENOUGH  
AWAY FROM HISPANIOLA. ONLY GRADUAL INTENSIFICATION IS FORECAST  
DUE  
TO THE SOMEWHAT DISORGANIZED INITIAL STATE OF THE DEPRESSION.  
AFTER  
THAT TIME...A COMBINATION OF INCREASING VERTICAL WIND SHEAR AND  
POSSIBLE LAND INTERACTION COULD SLOW THE DEVELOPMENT OF THE  
CYCLONE. THE NHC FORECAST IS ON THE LOW SIDE OF THE GUIDANCE  
ENVELOPE...AND IS CLOSER TO THE SHIPS AND LGEM MODELS. THE  
WIND SPEED PREDICTION ALSO FITS THE GENERAL IDEA OF THE GLOBAL  
MODELS...WHICH SUGGEST THAT THE CYCLONE WILL STRUGGLE AFTER IT  
LEAVES THE CARIBBEAN SEA. SOME INTENSIFICATION...PERHAPS DUE TO  
BAROCLINIC PROCESSES...IS POSSIBLE AT LONG RANGE AS THE CYCLONE  
INTERACTS WITH A MID-LATITUDE TROUGH.

THE DEPRESSION APPEARS TO BE MOVING ROUGHLY 305/8 AROUND THE  
SOUTHWESTERN PERIPHERY OF A MID-LEVEL RIDGE OVER THE CENTRAL  
ATLANTIC OCEAN. A LARGE TROUGH OVER THE WESTERN ATLANTIC OCEAN  
IS  
EXPECTED TO CAUSE THE RIDGE TO BREAK ALONG ABOUT 70W...WHICH  
SHOULD  
CAUSE THE CYCLONE TO TURN NORTHWARD IN TWO OR THREE DAYS. ONE  
COMPLICATING FACTOR IS THE LARGER DISTURBANCE LOCATED A FEW  
HUNDRED  
MILES NORTHEAST OF THE DEPRESSION. THE INTERACTION OF THESE TWO  
FEATURES MAKES THIS TRACK FORECAST MORE UNCERTAIN THAN WOULD BE  
SUGGESTED BY THE OVERALL MODEL SPREAD. THE NHC FORECAST IS NOT  
TOO  
FAR FROM THE MODEL CONSENSUS EARLY ON...AND THEN IS A BIT SLOWER  
THAN THE CONSENSUS AFTER THAT TIME...PUTTING LESS WEIGHT ON THE  
NORTHWARD GFDL/HWRF SOLUTIONS.

#### FORECAST POSITIONS AND MAX WINDS

INIT	04/2100Z	16.5N	66.2W	30 KT	35 MPH
12H	05/0600Z	17.4N	67.1W	35 KT	40 MPH
24H	05/1800Z	18.6N	68.1W	40 KT	45 MPH
36H	06/0600Z	19.7N	68.8W	40 KT	45 MPH
48H	06/1800Z	20.9N	69.2W	40 KT	45 MPH

72H	07/1800Z	23.1N	69.4W	45 KT	50 MPH
96H	08/1800Z	25.3N	68.9W	45 KT	50 MPH
120H	09/1800Z	29.0N	65.0W	50 KT	60 MPH

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FORECASTER BLAKE

2114: D11 good

2131: D12 good

2140: The strong echo mass near the center is still in about the same place, and probably still is very close to cyclone center. May need to move northbound track a short distance east of planned, and we have asked for an additional drop (13a) between D13 and D14 to be as close to the center as possible. Based on radar and USAF winds, expect some rather strong south winds at that location.

2150: D13 good

2200: D13a good

2204: D14 good

2214: D15 good

2223: D16 good

2232: D17 good

2237: Flight plan changed one more time and Leslie Lait has transmitted this additional change to the pilots and uploaded to MTS. It is the same as the major change discussed above, but with one leg changed after discussion with Scott Braun. The long southbound leg (from 27 N to 12.5 N) between waypoint 09 and waypoint 11 has been moved from 57.5 W to 58.5 W. Reasoning is that the major convective system NE of the tropical depression is along about 60 W, and while it is OK to lose the eastern leg, moving the remaining leg (W09 to W11) one degree westward would bring it closer to the convective system than leaving it at 57.5 W.

2242: D18 good

2251: D19 good

2301: D20 good

2317: D21 good

2329: D22 good

2339: D23 good

2349: D24 good

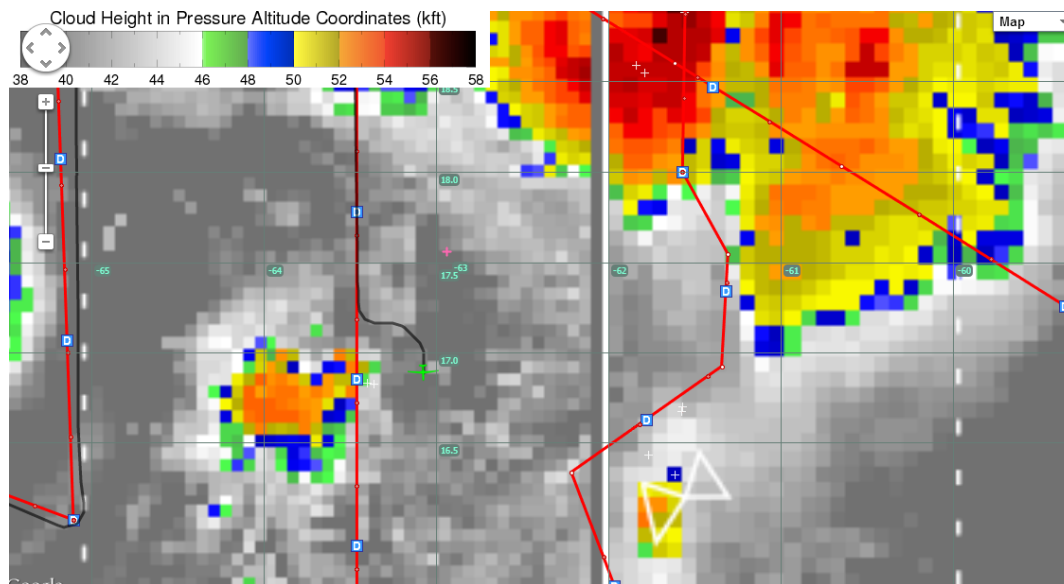
0000: D25 good

0010: D26 good

0023: D27 good

We have diverted around the convective cell due to cloud top height hazard as well as lightning.





0034: D28 good

0048: D29 good

0056: D30 good

0106: D31 good

0115: D32 good

0128: D33 good

0140: D34 good

0148: D35 good

0157: D36 good

0211: D37 good

0221: D38 good

0230: D39 good

0241: D40 good

0251: D41 good

0303: D42 good

0313: D43 good

0326: D44 good

Stopped counting drops, will only update if there is a problem in drops.

NHC discussion at 11 pm

TROPICAL STORM GABRIELLE DISCUSSION NUMBER 2  
NWS NATIONAL HURRICANE CENTER MIAMI FL AL072013  
1100 PM AST WED SEP 04 2013

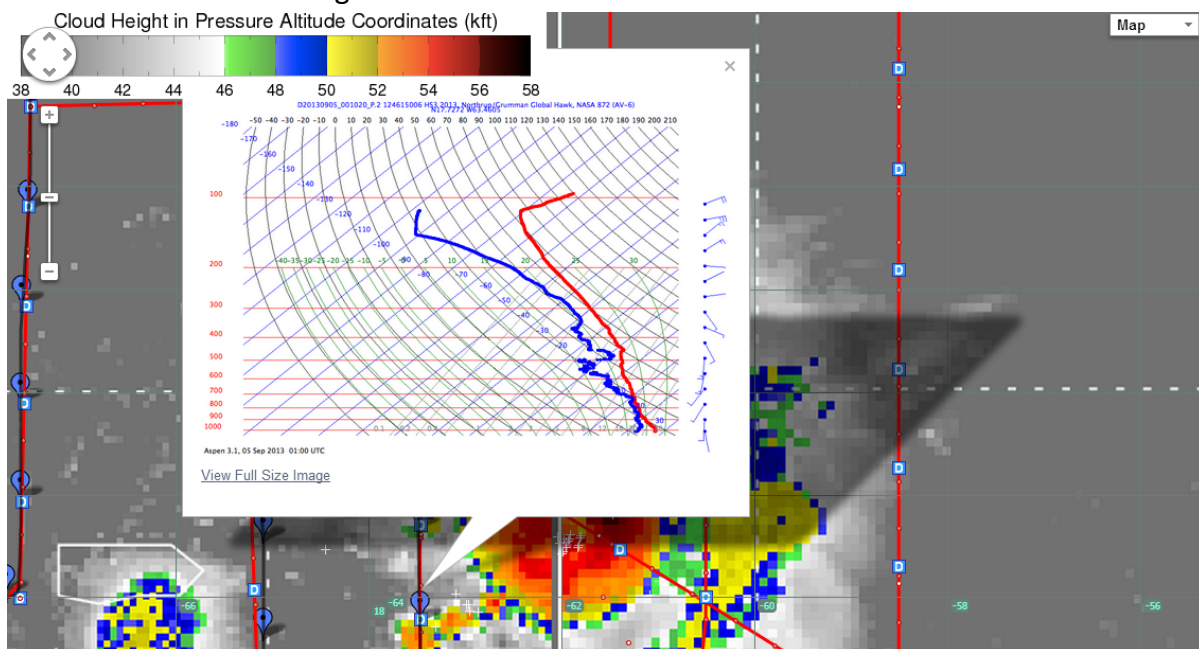
THE SATELLITE PRESENTATION OF THE CYCLONE CONSISTS OF A SMALL AREA OF VERY DEEP CONVECTION NEAR AND NORTHEAST OF THE SURFACE CENTER WHILE THE CONVECTIVE BANDS HAVE LARGELY DISSIPATED OVER THE PAST FEW HOURS. THE LARGE-SCALE OUTFLOW PATTERN OVER THE CYCLONE IS EXCELLENT WITH AN ENHANCED POLEWARD OUTFLOW CHANNEL SEEN IN WATER VAPOR IMAGERY. BASED ON THE LATEST SATELLITE CLASSIFICATIONS FROM BOTH TAFB AND SAB...THE INITIAL INTENSITY IS SET TO 35 KT...AND THE DEPRESSION IS NOW TROPICAL STORM GABRIELLE.

DROPSONDE DATA FROM THE NASA GLOBAL HAWK AIRCRAFT SUGGEST THAT THE CIRCULATION OF GABRIELLE IS TILTED TO THE NORTHEAST WITH HEIGHT...  
WITH A MID-LEVEL CIRCULATION SEEN IN DATA FROM THE SAN JUAN WSR-88D RADAR. THIS TILTED STRUCTURE IS CONSISTENT WITH SOUTHERLY TO SOUTHWESTERLY VERTICAL SHEAR OF 5 TO 10 KT SHOWN OVER THE CYCLONE  
BY THE UW-CIMSS AND SHIPS MODEL ANALYSES. IN ADDITION...THE DROPSONDE DATA SHOWED DRY AIR IN THE MID LEVELS OF THE ATMOSPHERE  
AROUND GABRIELLE. GIVEN THE ENVIRONMENT...THE SOMEWHAT DISORGANIZED STATE OF THE CIRCULATION...POSSIBLE LAND INTERACTION...AND THE PRESENCE OF THE LARGE AREA OF DISTURBED WEATHER NORTHEAST OF GABRIELLE...NOT MUCH STRENGTHENING IS EXPECTED IN THE SHORT TERM.  
THE NHC FORECAST IS IN GOOD AGREEMENT WITH THE INTENSITY CONSENSUS

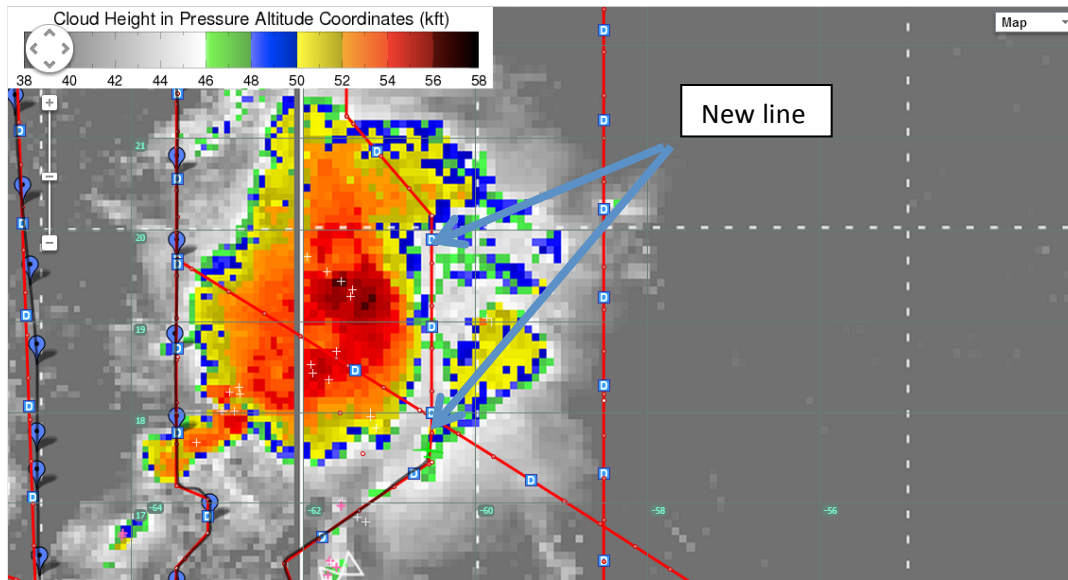
AIDS FOR THE FIRST 24 HOURS. IT IS ENTIRELY POSSIBLE THAT THE LOW-LEVEL CIRCULATION WILL DISSIPATE IN THE NEXT 24 HOURS. ASSUMING THAT GABRIELLE SURVIVES...ONLY LIMITED INTENSIFICATION IS SHOWN LATER IN THE PERIOD AS THE SHEAR INCREASES DRAMATICALLY AHEAD OF AN UPPER-LEVEL TROUGH. THE NHC FORECAST REMAINS BELOW MUCH OF THE INTENSITY GUIDANCE LATE IN THE PERIOD...WHICH SEEMS TOO HIGH GIVEN THE INCREASE IN SHEAR. THE NHC FORECAST IS ALSO SUPPORTED BY THE GLOBAL MODELS...WHICH DO NOT SHOW MUCH INTENSIFICATION AFTER GABRIELLE MOVES NORTH OF THE CARIBBEAN SEA.

THE LOW-LEVEL CENTER HAS BEEN DIFFICULT TO LOCATE...BUT THE GLOBAL HAWK DROPSONDE DATA SUGGEST IT REMAINS SOUTHWEST OF THE MID-LEVEL CENTER SEEN IN RADAR IMAGERY.

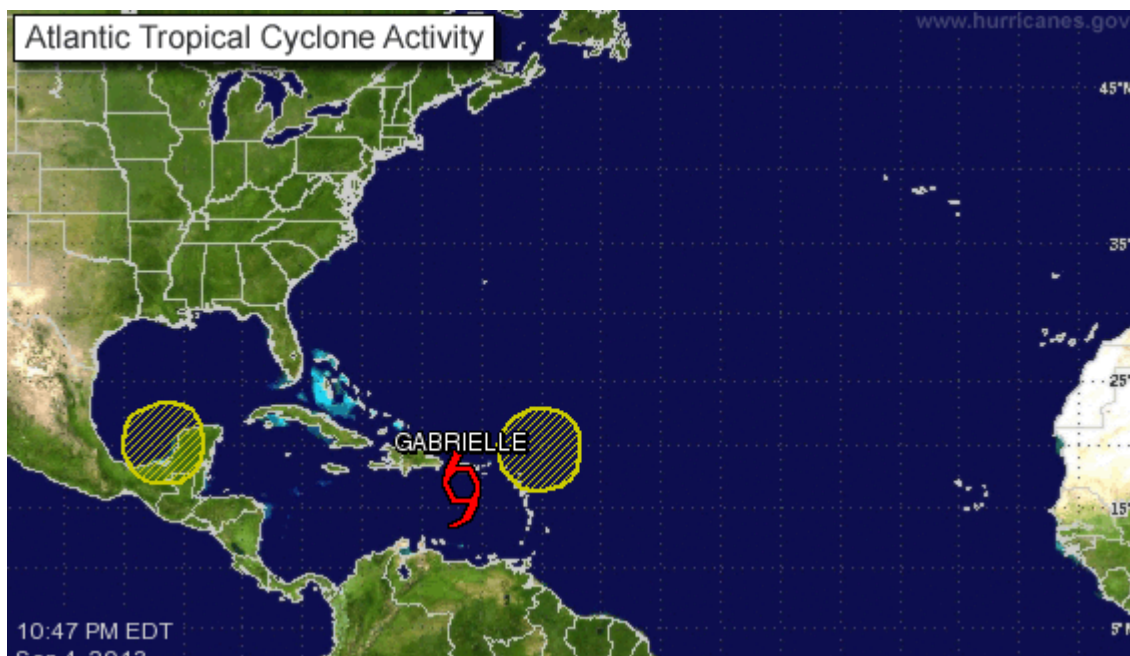
Here is a dropsonde out in front of the convective mass showing a fairly moist profile. Most of the other sondes on this line out ahead of the system are quite dry with light winds from the west. It will be interesting to see how the convection will evolve as it moves into this air mass.



We changed the flight track to avoid deep convection for the current leg. The current leg was positioned over high cloud tops with lightning flashes. So, we moved it over to the East and there are no longer hazards along this line.



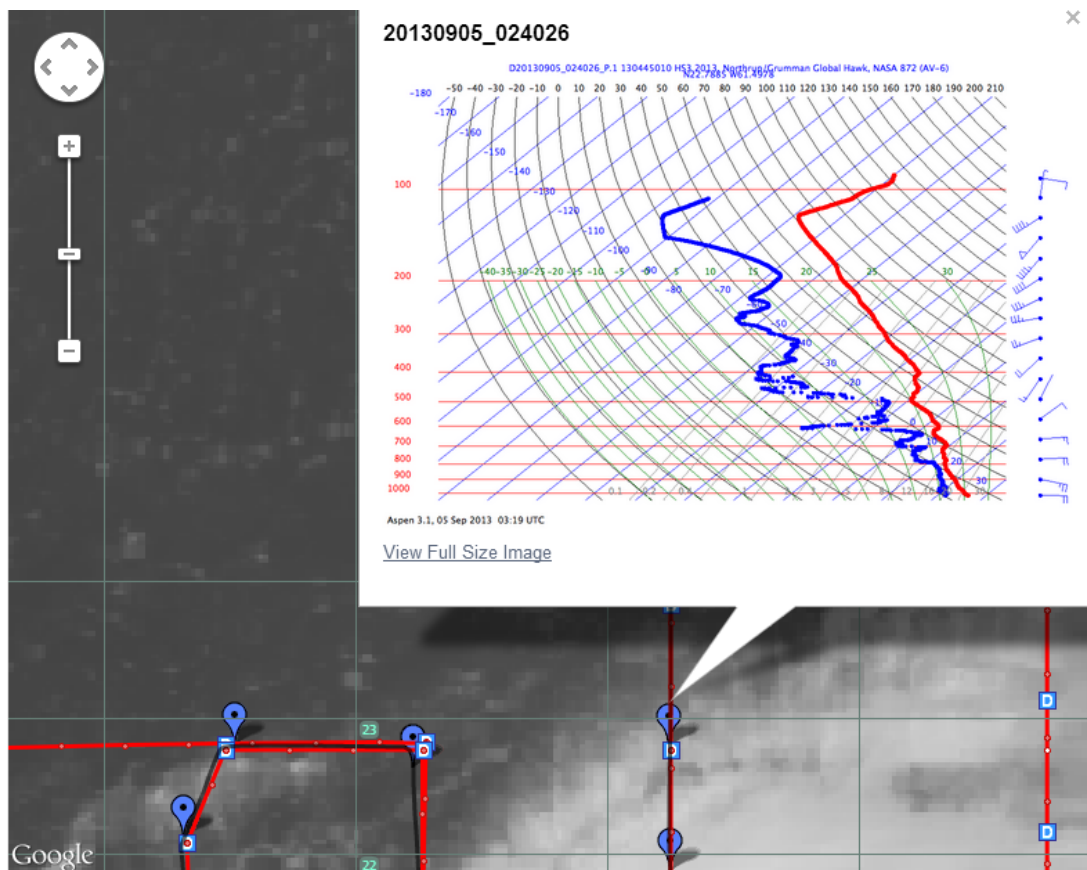
As of ~ 10:47 PM EDT on 9/4/2013 the NHC has classified P25/97L as tropical storm Gabrielle with minimum central pressure of 1008 mb and maximum sustained winds of 40 mph. Several references to Global Hawk data in the NHC discussions that helped to classify the system as a tropical storm.



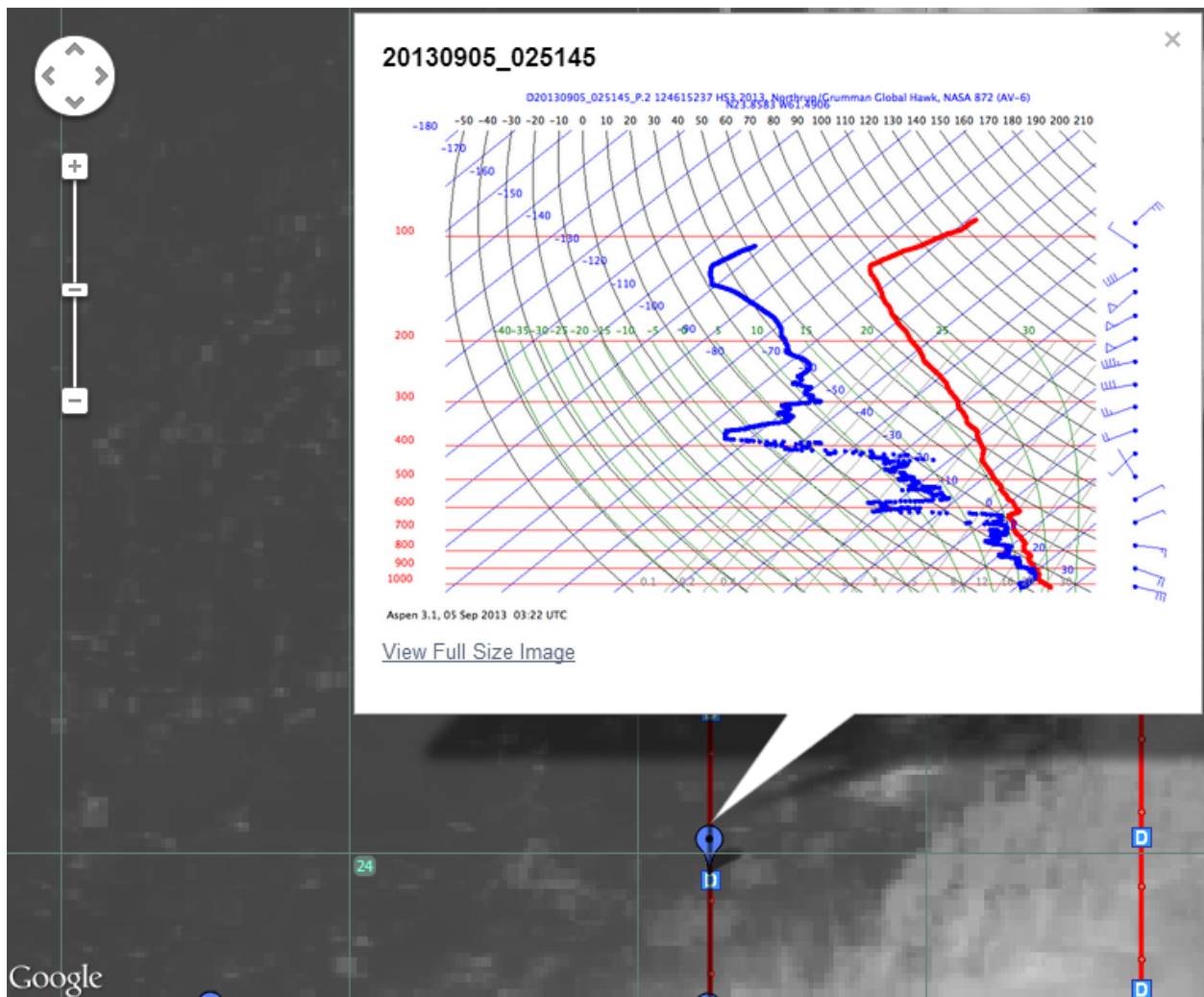




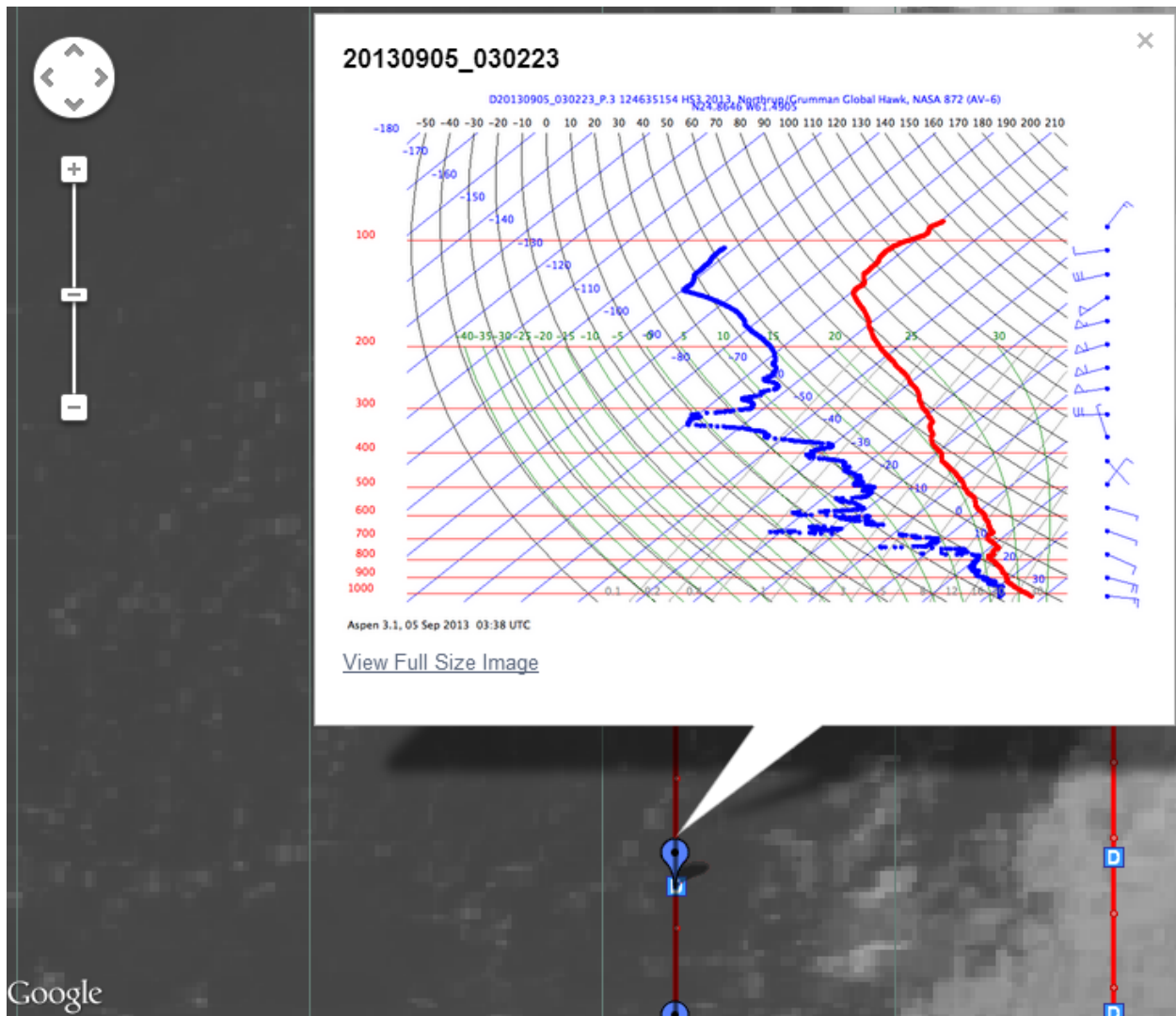
0357 UTC The series of drops below highlight very strong winds in the 300 – 125 mb layer associated with an outflow jet from this system (P30). Winds reach 50 knots at ~ 150 mb. The associated IR cloud structure can be seen in the background image.



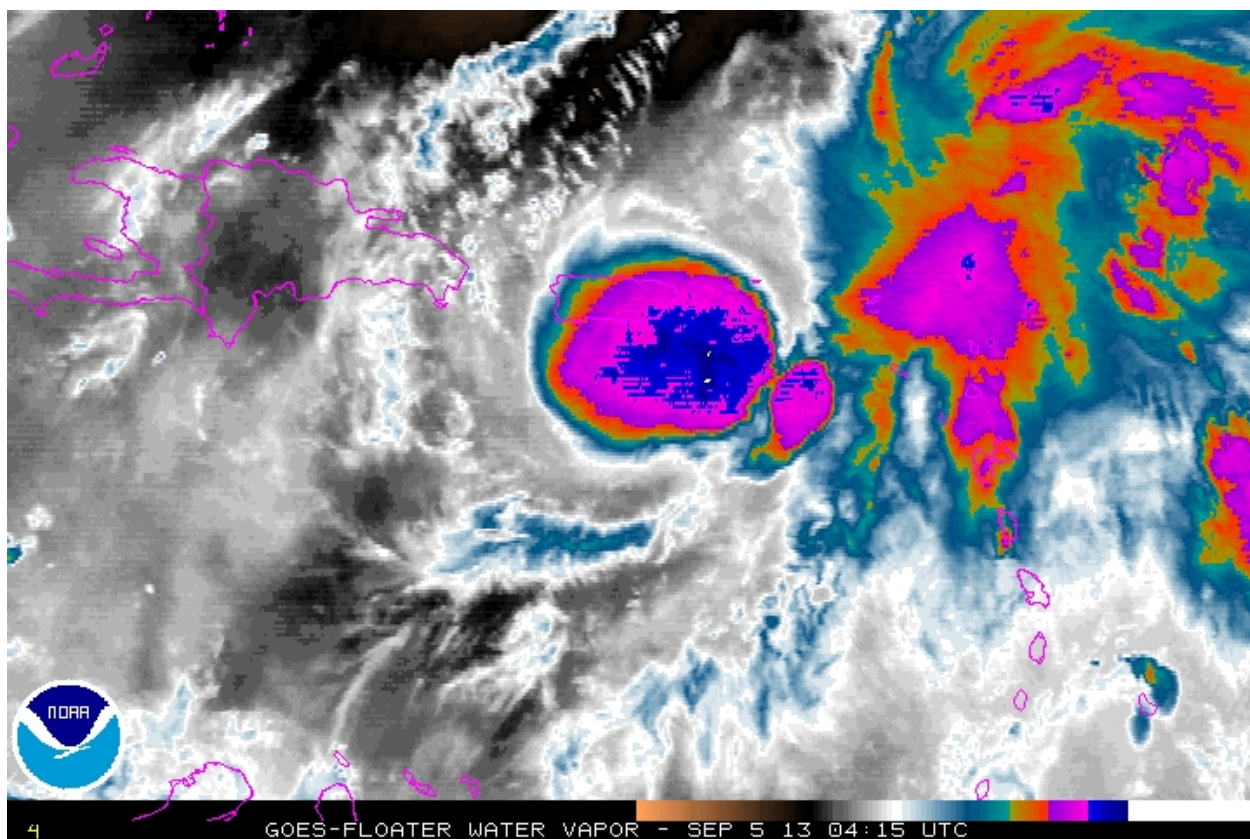
Outflow jet structure shows thick region of 50 knot winds with very dry air in mid-upper levels. The associated IR cloud structure can be seen in the background image.



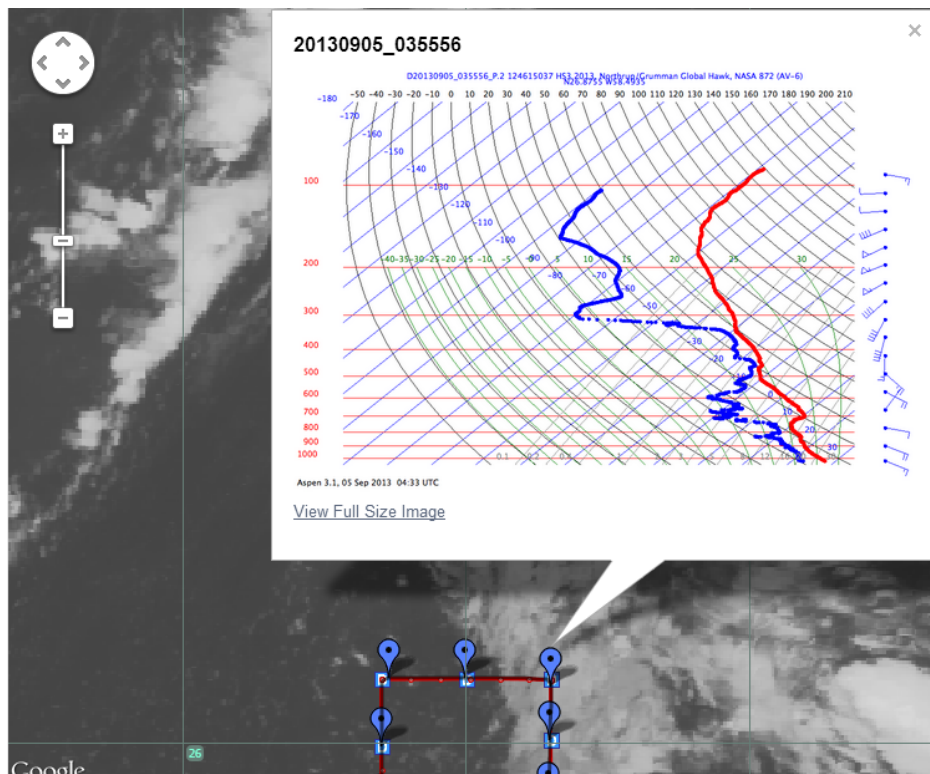
Outflow jet structure shows thick region of 60 knot winds with very dry air in mid-upper levels. The associated IR cloud structure can be seen in the background image. Winds are weak at lower levels with a very sharp gradient in wind speeds at 300 mb. This is the start of the outflow layer. These outflow winds are very strong likely because of the strong convection occurring in P30 at this time. The outflow is evacuating mass.



0449 UTC Water vapor image of TS Gabrielle at 0415 UTC showing a burst of convection close to the center of circulation.

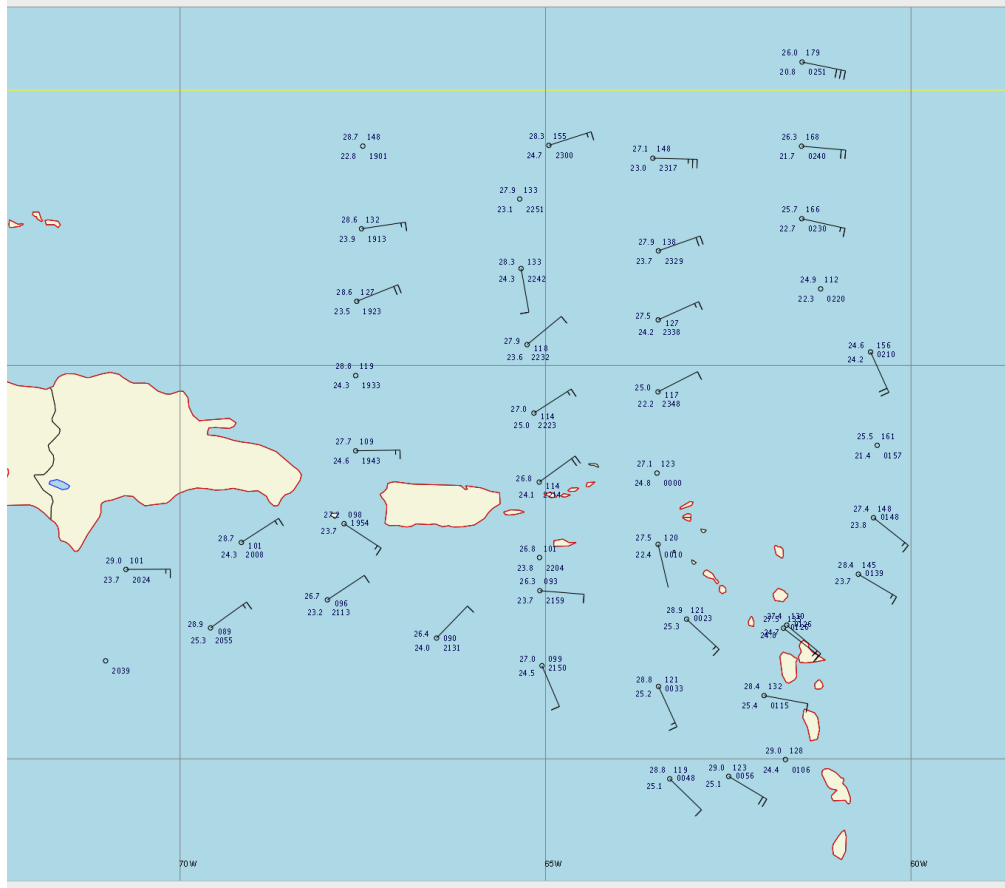


0520 UTC Strong outflow of 50 – 60 knots located in a 300 – 150 mb layer associated with very dry air aloft.

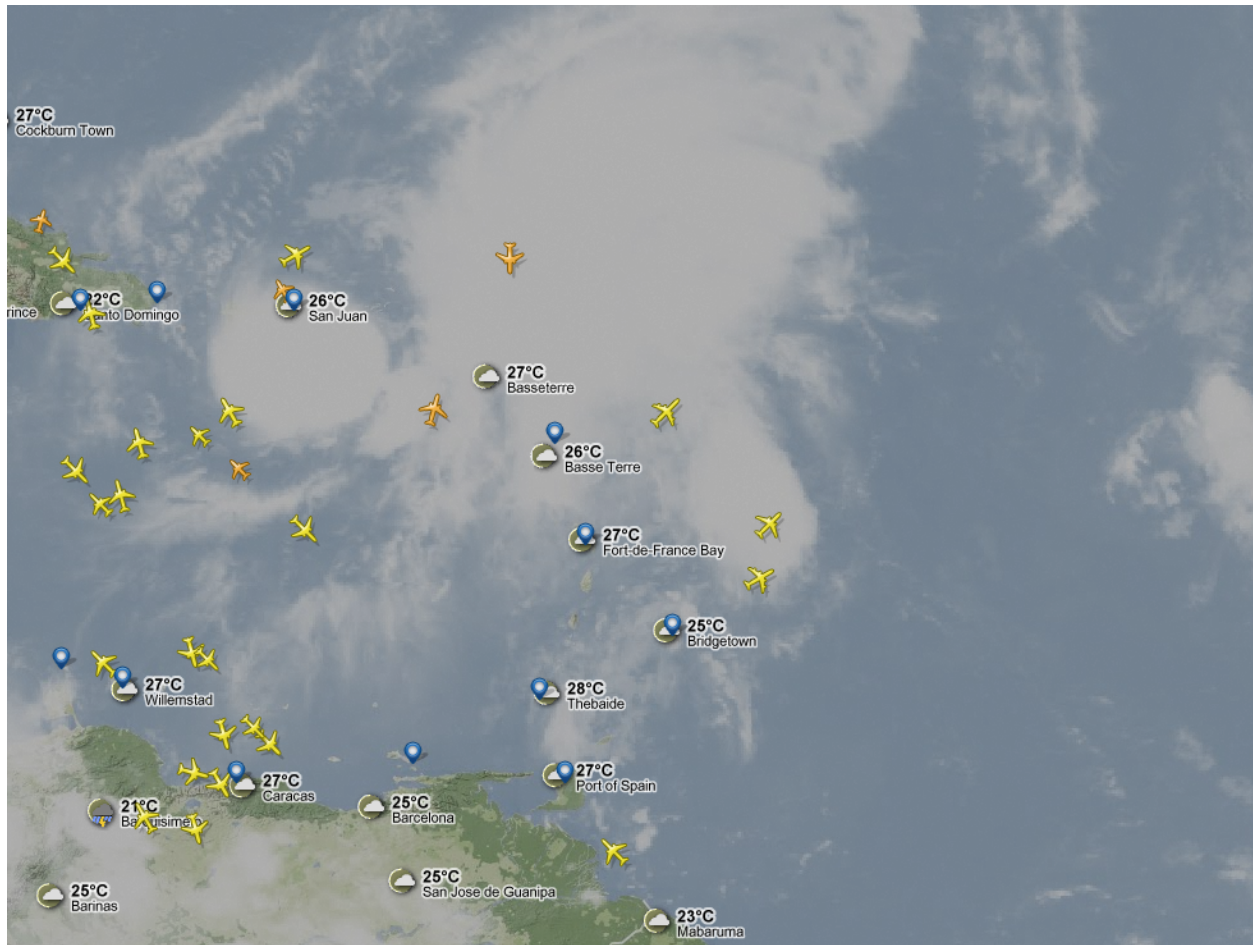


0523 UTC surface synoptic map of dropsonde winds shows SE flow on the SE side of P30 and E to NE flow on the Northern side of P30. This could be a sign of a broad scale circulation. We have a planned flight track through the center of P30 and this will give us a better indication of the presence of a circulation.



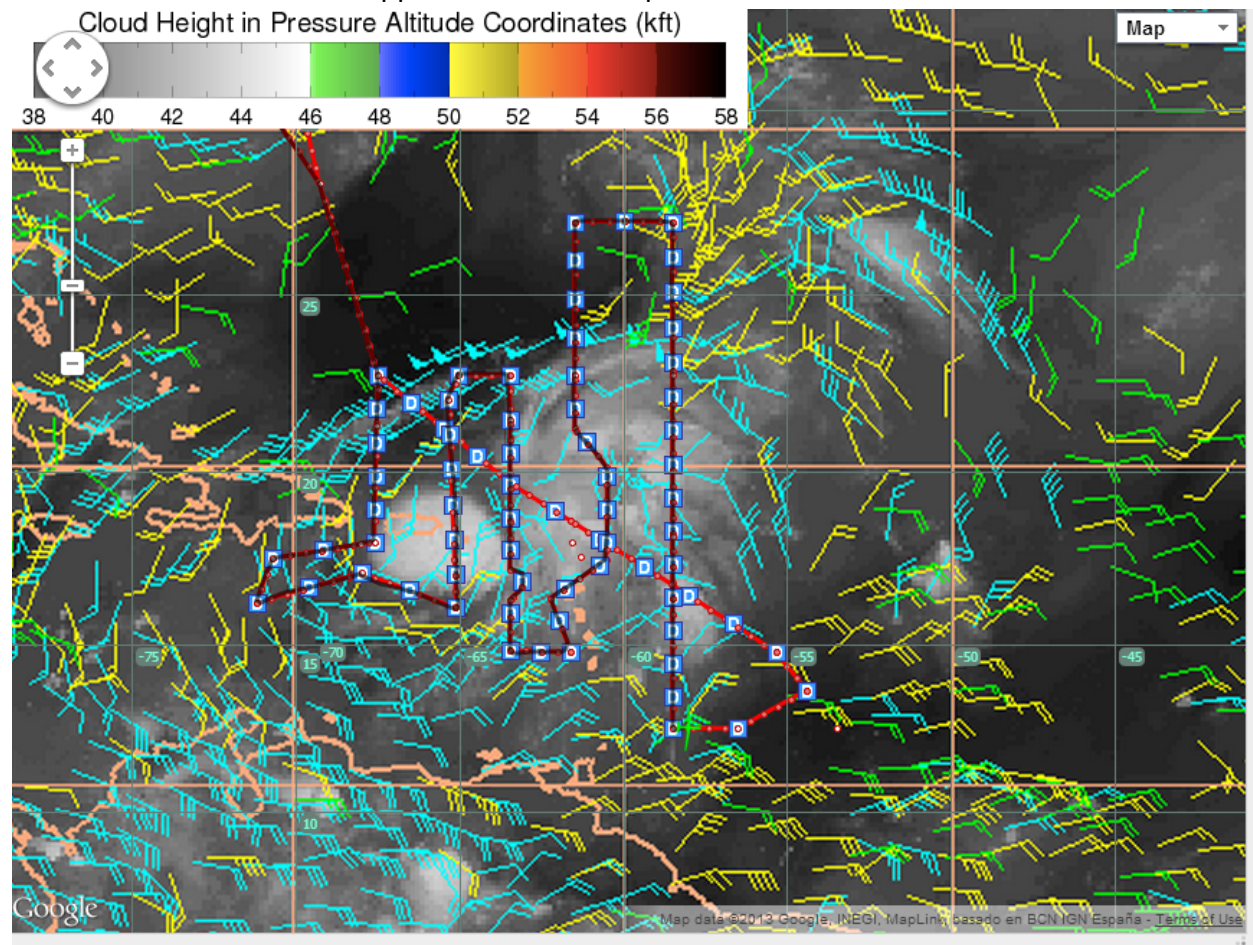


0558 Skipped drop DA58 – pilots were not able to contact ATC for clearance. Looks like 2 commercial jets below us at this time on the south eastern corner of the convection.



0627 First drop after temporary hold on drops (3 drops missed).

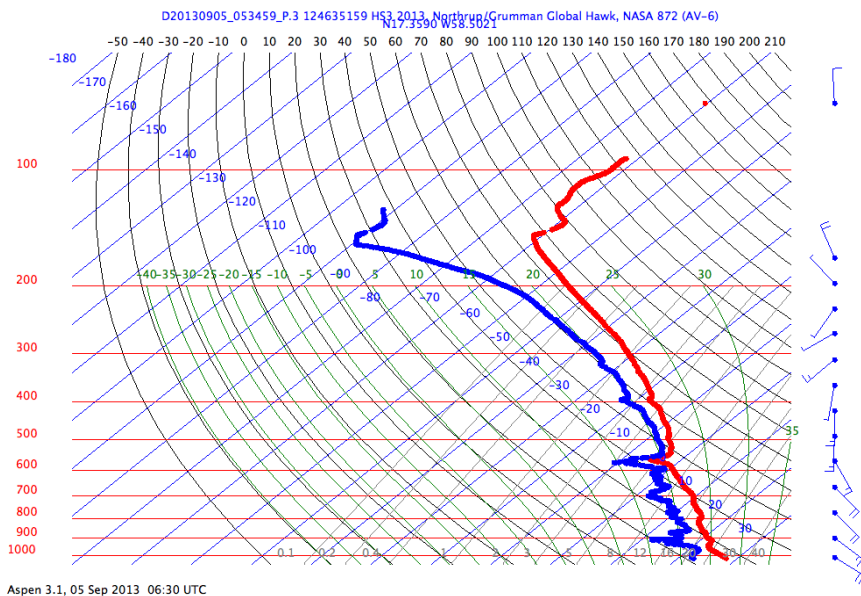
0632 CIMSS 0600UTC Mid-Upper Level Water Vapor & Infrared Winds



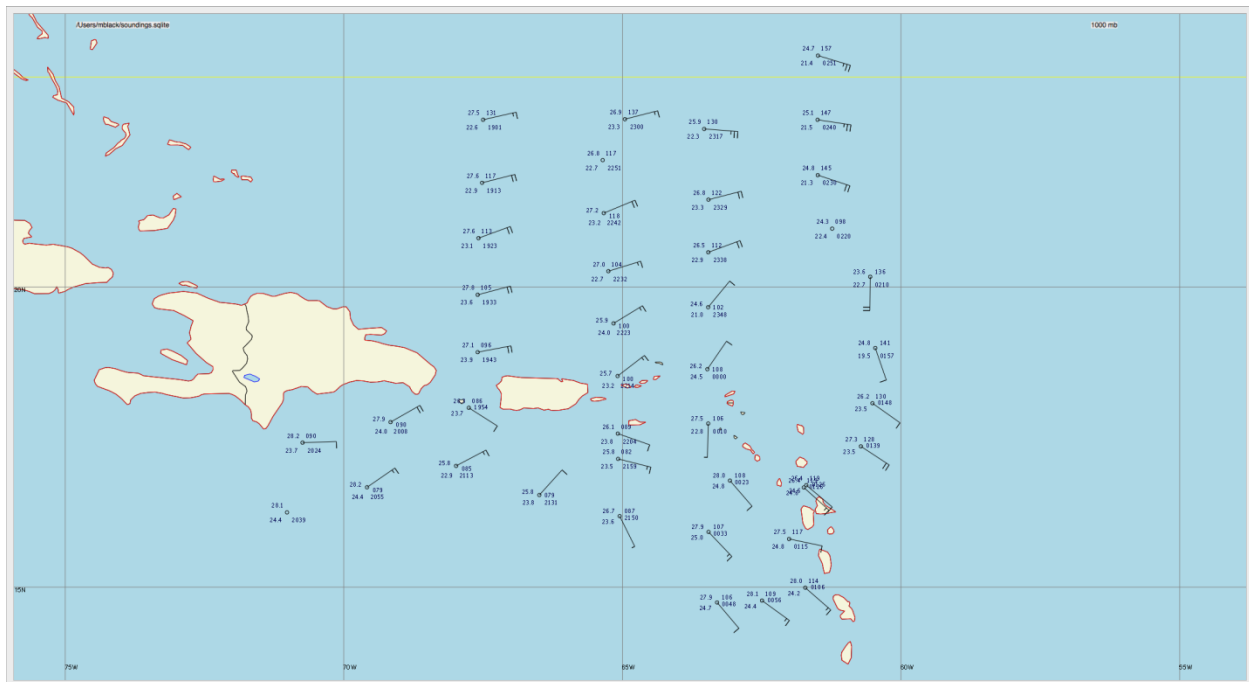
0650 Good (DA62 -56.5964, 12.5111)

Drops seem to be good unless otherwise noted.

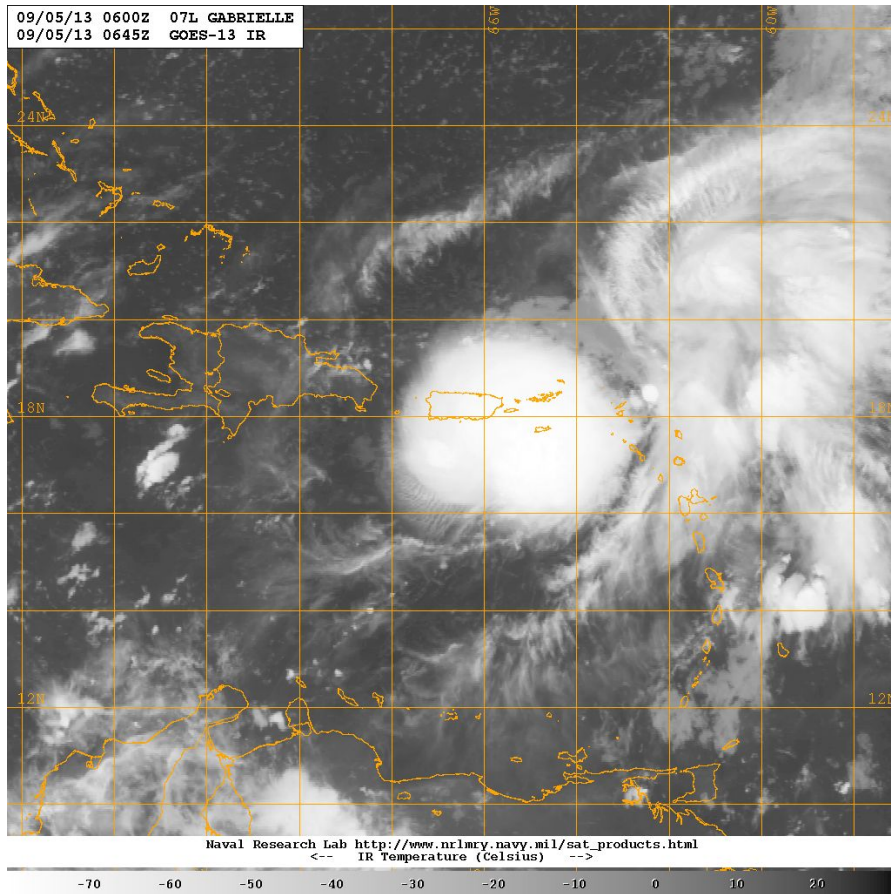
0700 Discussion on MTS about the double topopause evident in some drops notably 0534.



0704 Updated synoptic maps. Circulation associated with the Dent at 1000mb, surface maps have easterlies across the region though.

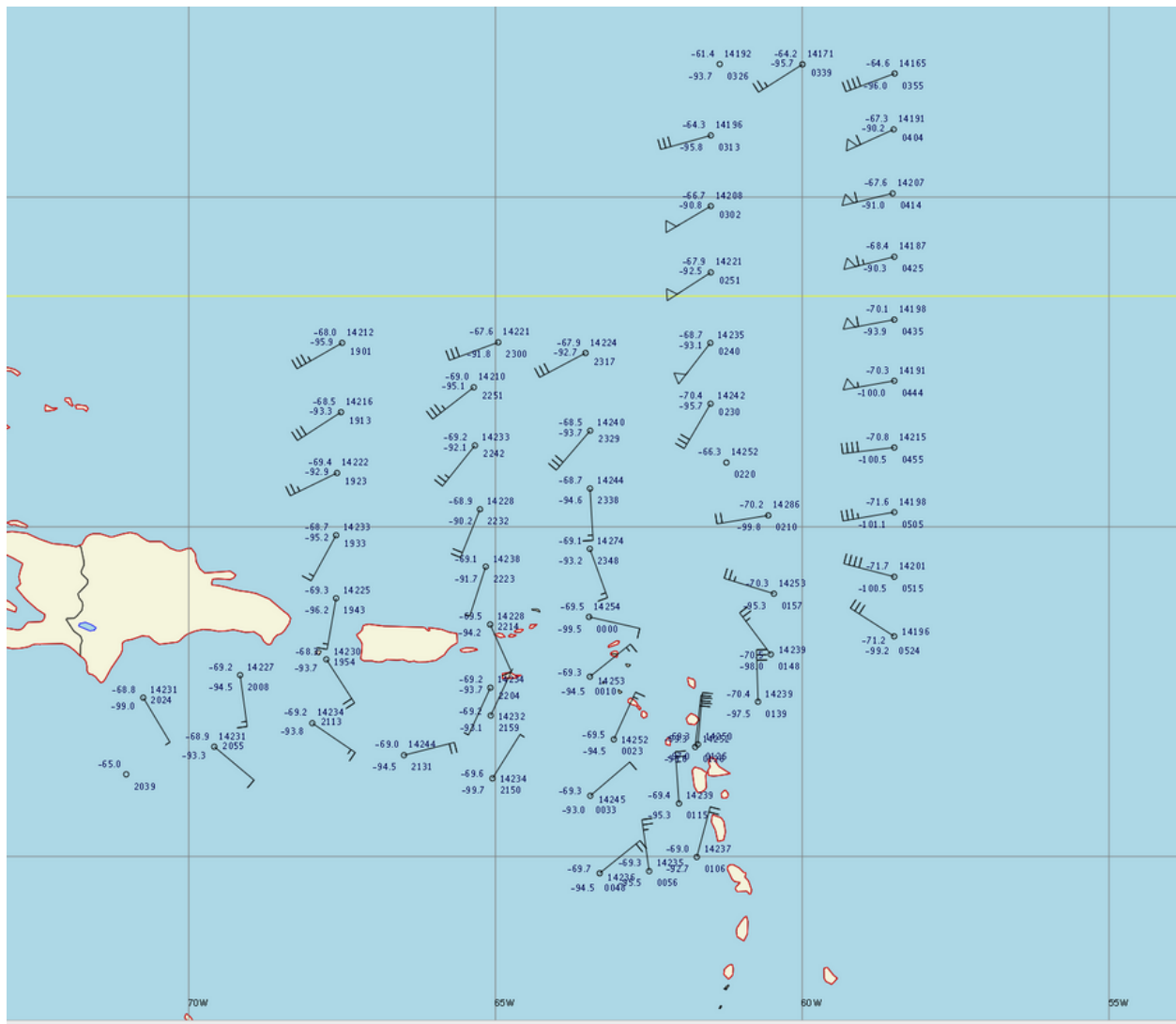


0720 IR image from GOES 13 @ 0645. Continued deep convection over Gabrielle with the dent continuing to collapse for the time being.

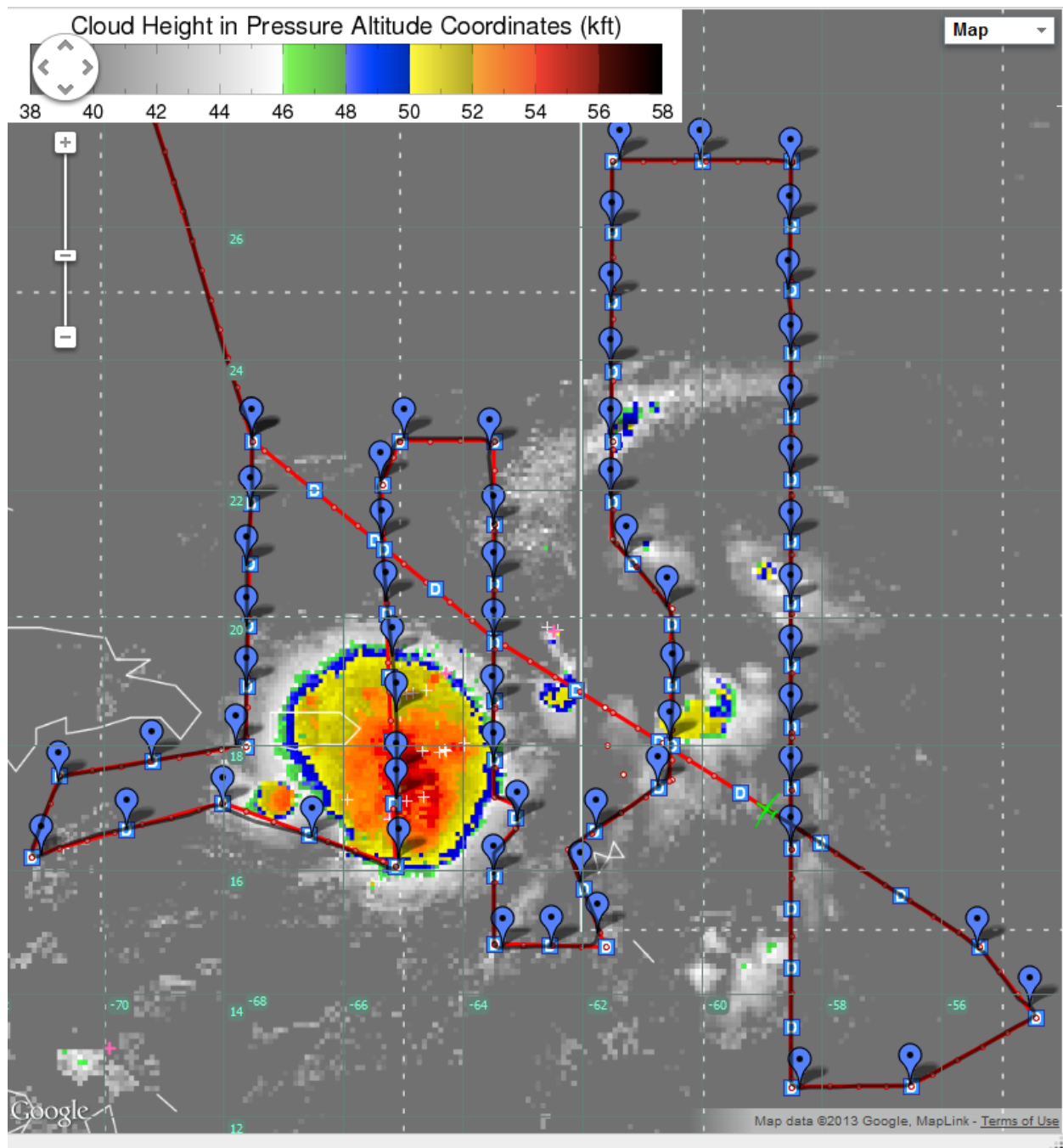


0738 Proposed plan to add drops at the mid points between Drop 67 and 74. Additional 7 sondes along the north-western leg, with 1 extra sondes ~80nm on the NNW leg home (after Drop 74).



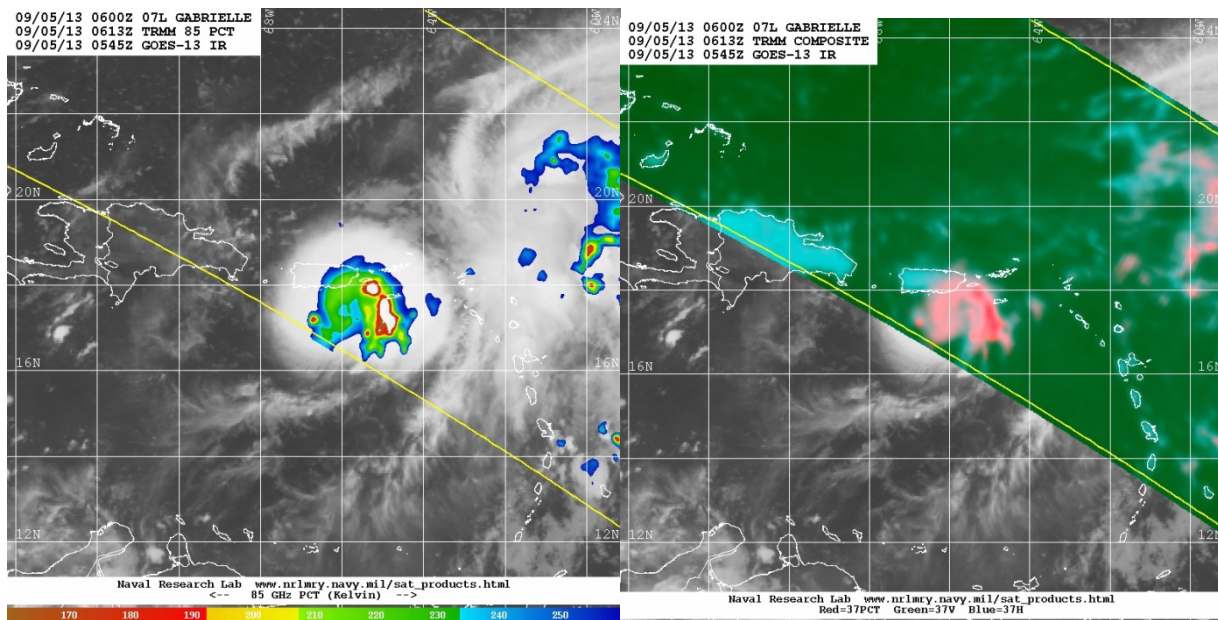


150 mb level winds show well define outflow region north of the storm. The north and southbound legs on the east side crossed over the axis of the jet.

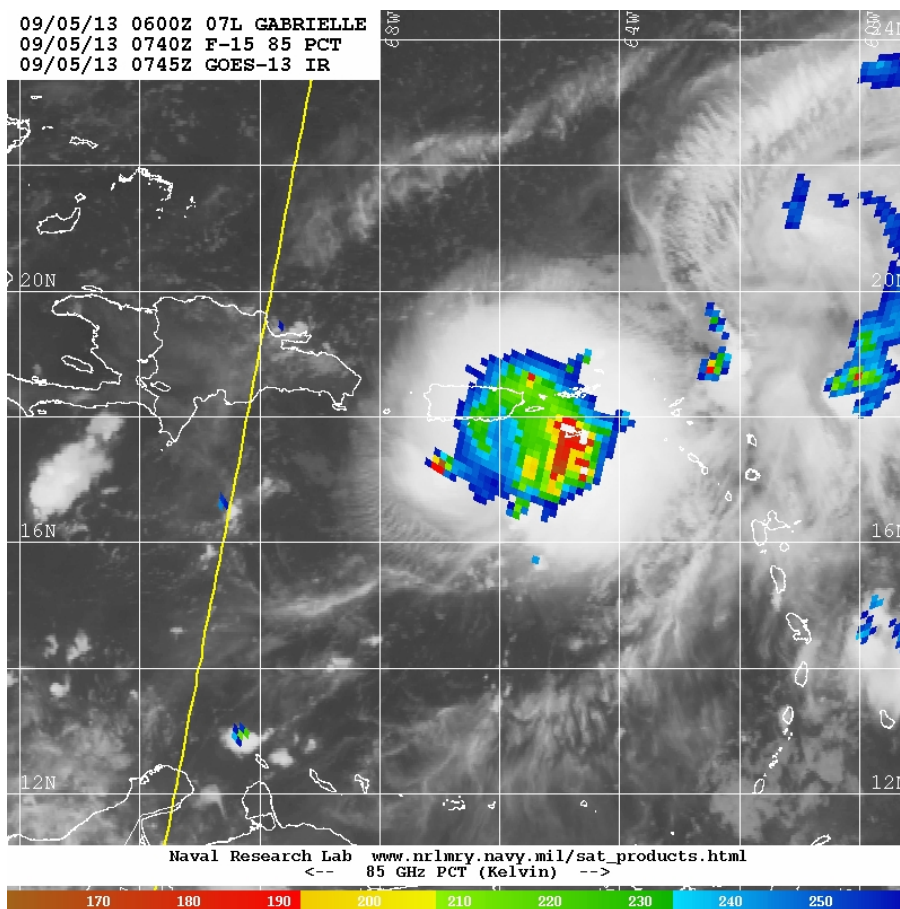


Currently heading northwest along final leg across the storm. We are doing drop about every 8 minutes along the leg to get high-resolution structure of the outflow north of the storm.

0817 Drop location 67 (65<sup>th</sup> sonde) released—good data.

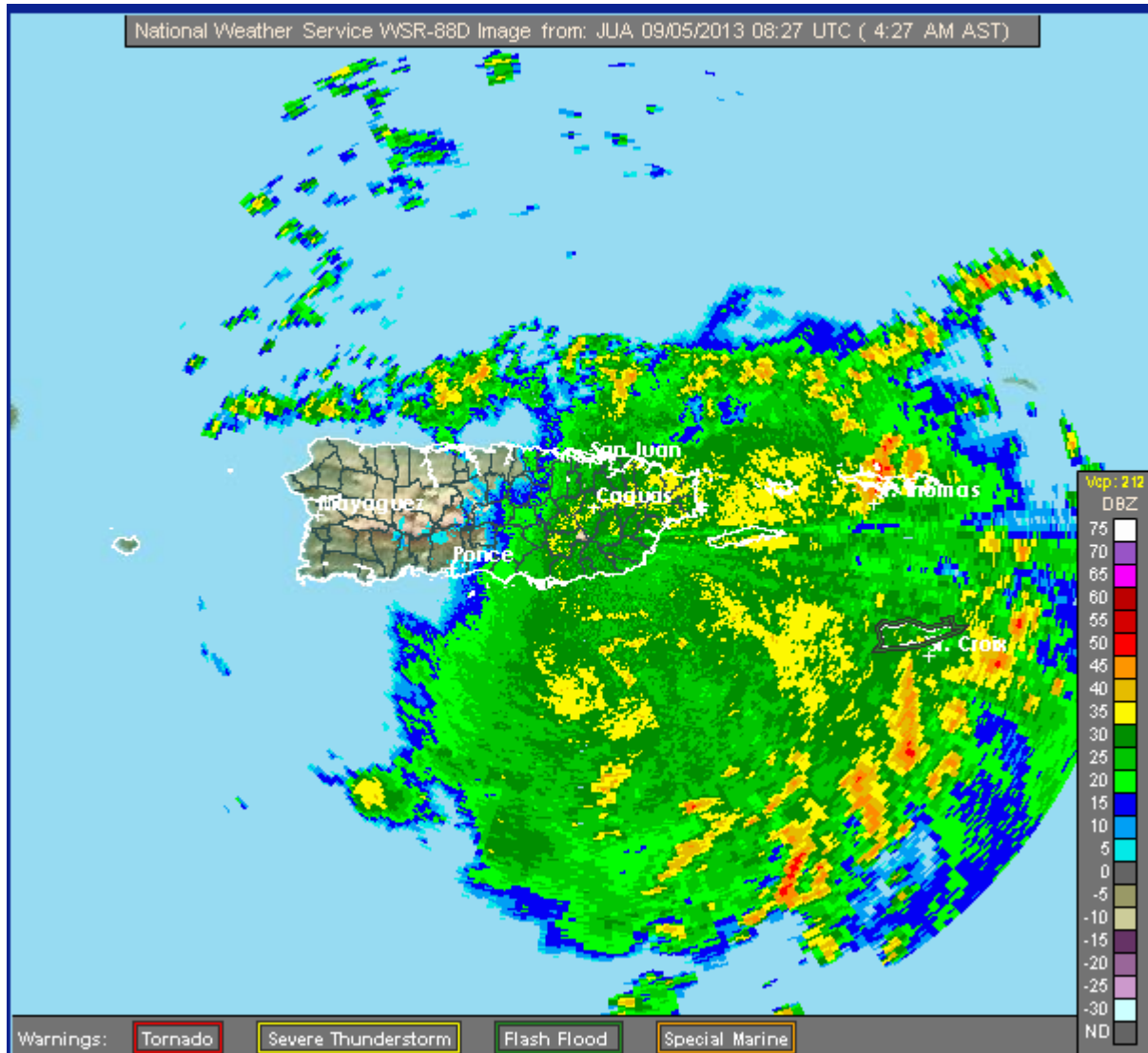


TRMM overpass at 0613 UTC shows low 85 GHz PCT on the east side.



Here is the 85 PCT from SSM/I a little later.

0824 Drop location 67A (66<sup>th</sup> sonde) released—good data.



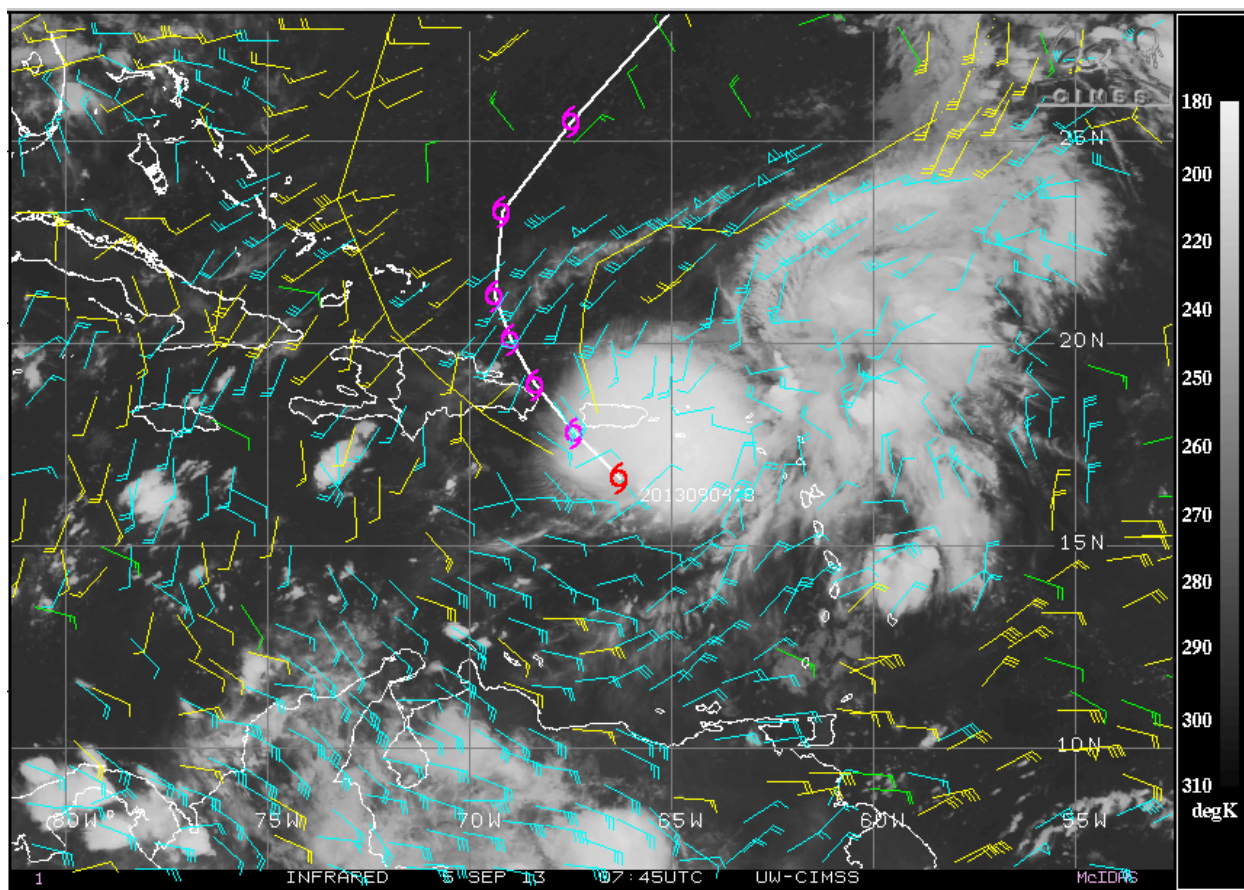
San Juan radar at 0827 UTC shows widespread precipitation with embedded convective cells on the east side of the center.

0833 Drop location 68 (67<sup>th</sup> sonde) released—good data.

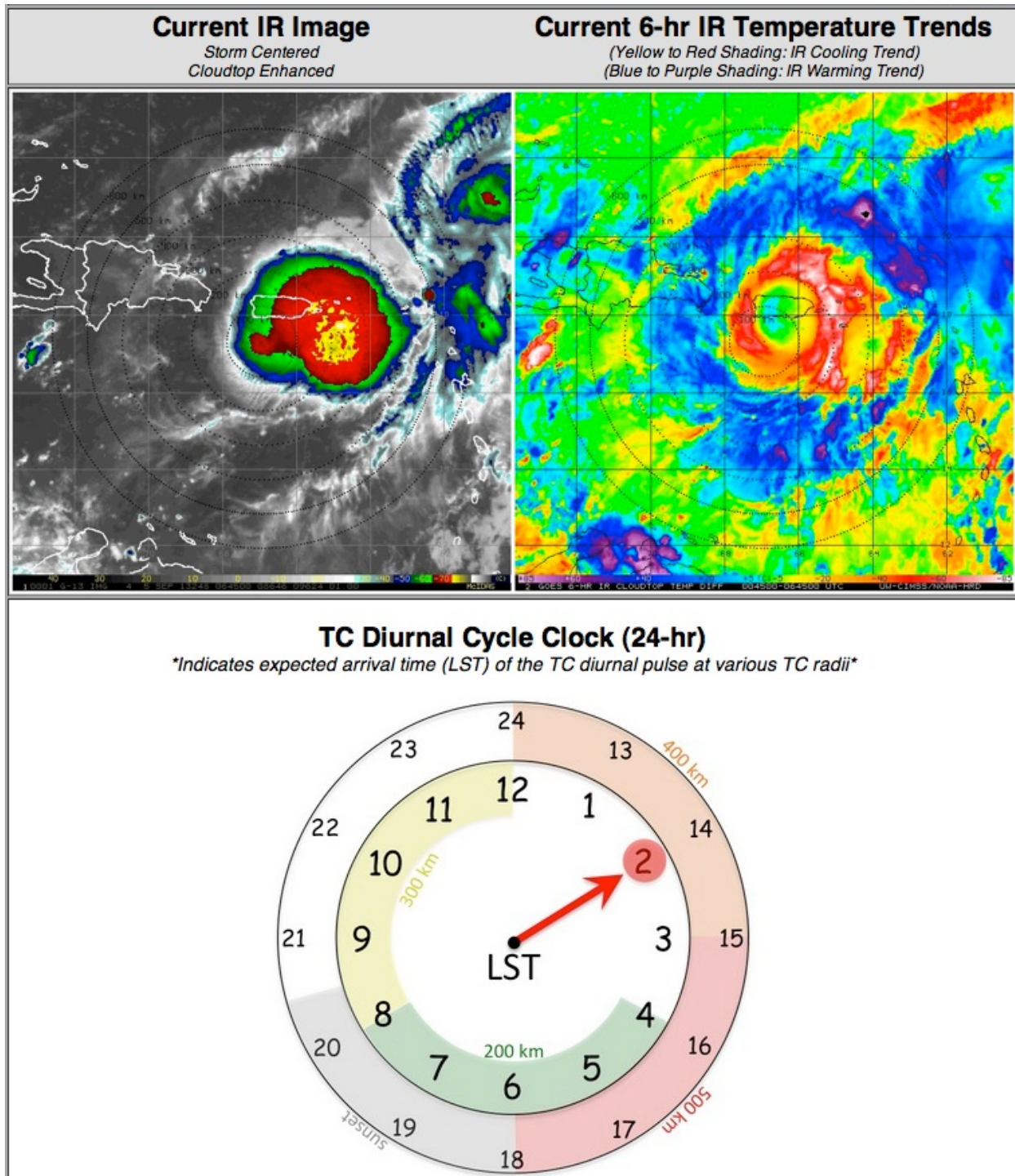
0841 Drop location 68A (68<sup>th</sup> sonde) released—good data.

0848 Drop location 69 (69<sup>th</sup> sonde) released—good data.

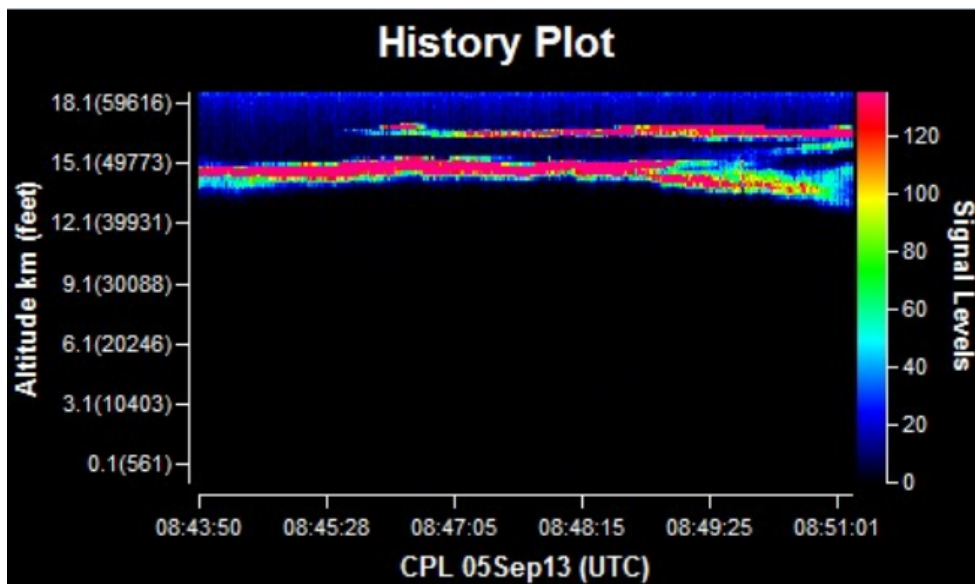
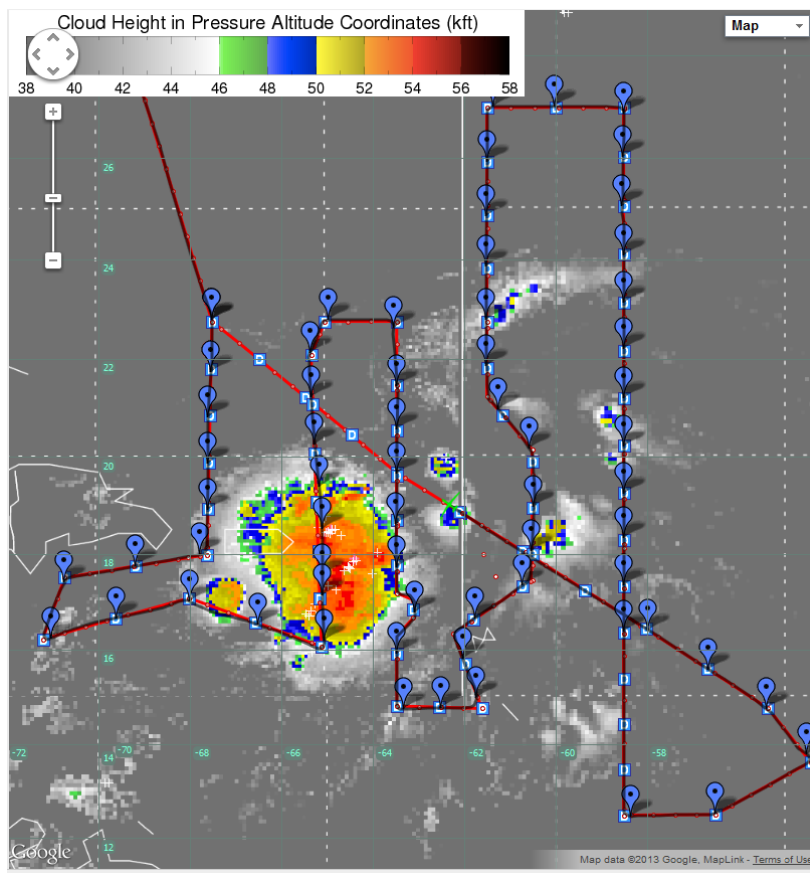




0745 UTC GOES imagery shows that the upper anticyclone is now centered on Gabrielle. Flow above the eastern disturbance is now more disorganized, but main outflow branch on its northern side.



This image shows Jason Dunion's diurnal pulse data. The 6-hr trend shows an intense ring around Gabrielle indicating the expansion of the cirrus shield and warming near the center.



0852 Crossed over small cell NE of Gabrielle. CPL shows solid cloud deck at 50kft with a thinner cirrus layer above it near 55 kft.

0855 Drop location 69A (70<sup>th</sup> sonde) released—good data.

0904 Drop location 70 (71<sup>th</sup> sonde) released—good data.

0911 Drop location 70A (72<sup>th</sup> sonde) released—good data.

0917 Drop location 71 (73<sup>th</sup> sonde) released—good data.

NHC discussion at 5 am

TROPICAL STORM GABRIELLE DISCUSSION NUMBER 3  
NWS NATIONAL HURRICANE CENTER MIAMI FL AL072013  
500 AM AST THU SEP 05 2013

ALTHOUGH THE AREA OF DEEP CONVECTION HAS EXPANDED SIGNIFICANTLY DURING THE PAST SEVERAL HOURS AND THE OUTFLOW IS EXCELLENT... SURROUNDING SURFACE OBSERVATIONS DO NOT SUGGEST THAT THERE HAS BEEN ANY IMPROVEMENT OF THE CIRCULATION. IN ADDITION...MICROWAVE OR

DOPPLER RADAR DATA DO NOT SHOW ANY DEVELOPMENT OF AN INNER CORE...ALTHOUGH RADAR IMAGES SHOW A WELL-DEFINED MID-LEVEL CENTER

TO THE EAST OF THE SURFACE LOCATION. I WOULD NOT BE SURPRISED IF THERE IS A REFORMATION OF THE SURFACE CENTER. A RECONNAISSANCE PLANE LATER THIS MORNING WILL HELP US TO DETERMINE IF THIS IS THE

CASE. SUBJECTIVE ESTIMATES FROM TAFB AND SAB AS WELL AS OBJECTIVE

ESTIMATES FROM THE UNIVERSITY OF WISCONSIN...CIMSS...ARE 2.5 ON THE

DVORAK SCALE. ON THIS BASIS...THE INITIAL INTENSITY IS KEPT AT 35

KNOTS...AND THESE WINDS ARE PROBABLY CONFINED TO A VERY SMALL AREA

NEAR THE CENTER. THE INTENSITY FORECAST IS HIGHLY UNCERTAIN. MOST

OF THE GLOBAL MODELS KEEP A WEAK CYCLONE FOR A FEW DAYS WITH THE EXCEPTION OF THE ECMWF WHICH DISSIPATES GABRIELLE JUST NORTH OF HISPANIOLA IN A COUPLE OF DAYS. GIVEN THE STRONG WESTERLY SHEAR WHICH IS FORECAST TO BECOME ESTABLISHED ALONG THE FORECAST PATH OF

GABRIELLE...THE DISSIPATION OPTION OF THE ECMWF IS NOT OUT OF THE

QUESTION. AT THIS TIME...THE NHC FORECAST FOLLOWS THE MODEL CONSENSUS SHOWING SOME SLIGHT STRENGTHENING GIVING CREDIT TO THE OTHER MODELS.

ALTHOUGH THE SURFACE CENTER IS DIFFICULT TO FIND ON IR IMAGES...IT

APPEARS TO BE ON THE WESTERN EDGE OF THE DEEP CONVECTION. THE  
 BEST  
 ESTIMATE OF THE INITIAL MOTION IS TOWARD THE NORTHWEST OR 320  
 DEGREES AT 7 KNOTS. GABRIELLE IS EMBEDDED WITHIN A WEAK  
 STEERING  
 FLOW SOUTH OF A NARROW RIDGE OF HIGH PRESSURE OVER THE WESTERN  
 ATLANTIC. IN A DAY OR TWO...A MID-LEVEL TROUGH IS FORECAST TO  
 MOVE  
 FROM THE UNITED STATES EASTWARD ACROSS THE ATLANTIC...CAUSING  
 GABRIELLE TO RECURVE AND MOVE TOWARD THE OPEN ATLANTIC. THE  
 OFFICIAL FORECAST IS VERY CLOSE TO THE MULTI-MODEL CONSENSUS AND  
 IS  
 NOT TOO DIFFERENT FROM THE PREVIOUS ONE.

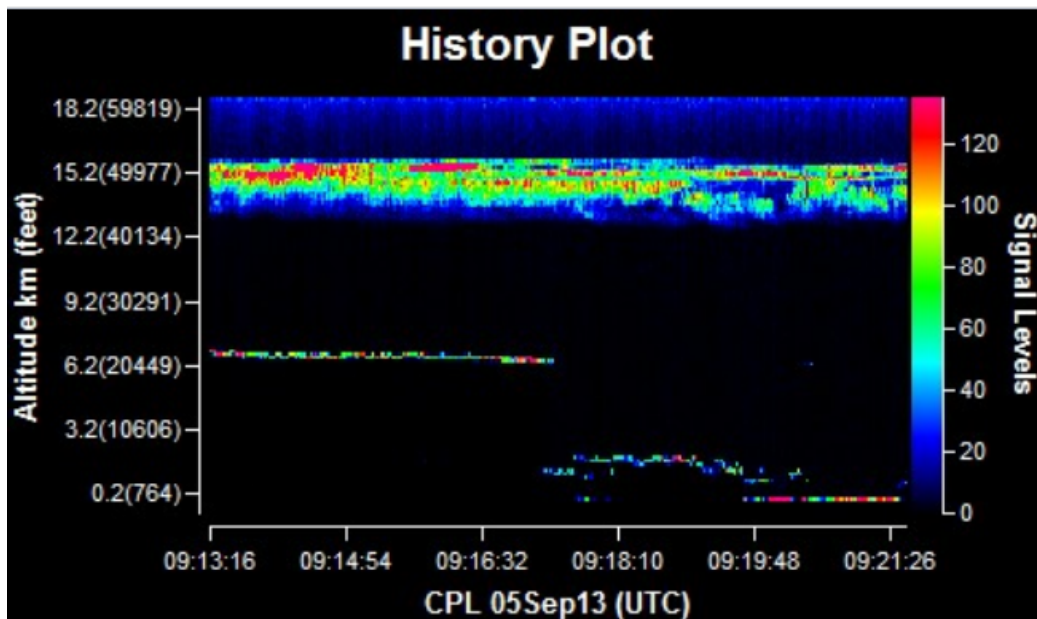
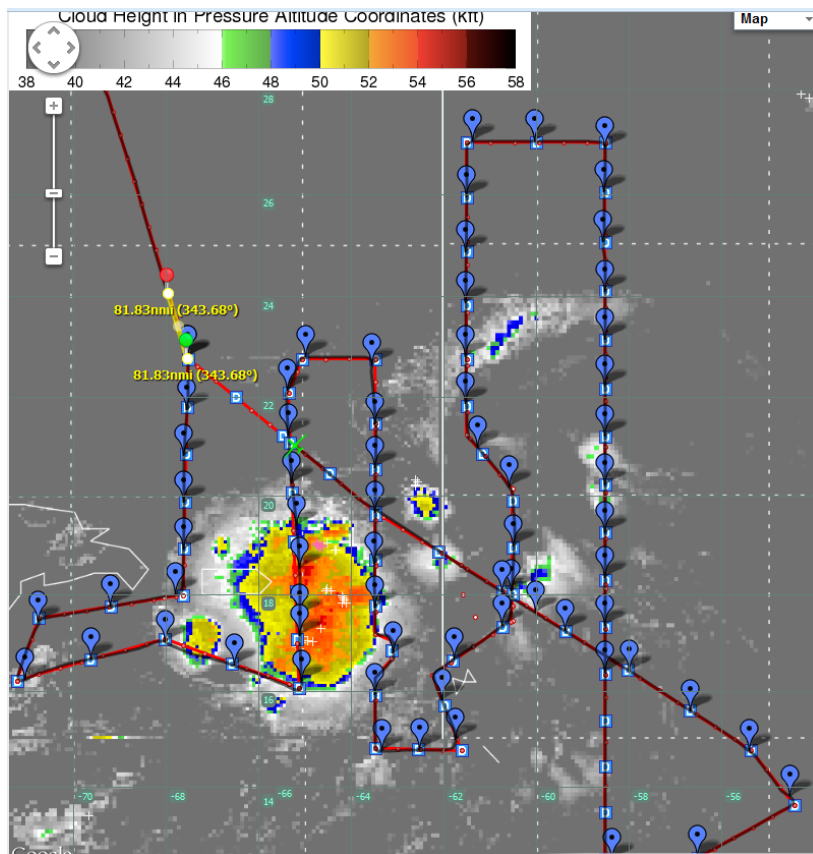
REGARDLESS OF THE EXACT TRACK OF THE CENTER OF GABRIELLE DURING  
 THE  
 NEXT 24 HOURS...THE MAIN THREAT WILL BE HEAVY RAINFALL OVER  
 PORTIONS  
 OF PUERTO RICO AND THE EASTERN PORTION OF THE DOMINICAN  
 REPUBLIC.

#### FORECAST POSITIONS AND MAX WINDS

INIT	05/0900Z	17.5N	66.9W	35 KT	40 MPH
12H	05/1800Z	18.5N	67.7W	35 KT	40 MPH
24H	06/0600Z	19.7N	68.5W	40 KT	45 MPH
36H	06/1800Z	20.9N	69.1W	45 KT	50 MPH
48H	07/0600Z	21.8N	69.5W	50 KT	60 MPH
72H	08/0600Z	24.0N	69.0W	50 KT	60 MPH
96H	09/0600Z	27.0N	66.0W	50 KT	60 MPH
120H	10/0600Z	31.5N	62.5W	50 KT	60 MPH

0922 Drop location 71A (74<sup>th</sup> sonde) released—good data.





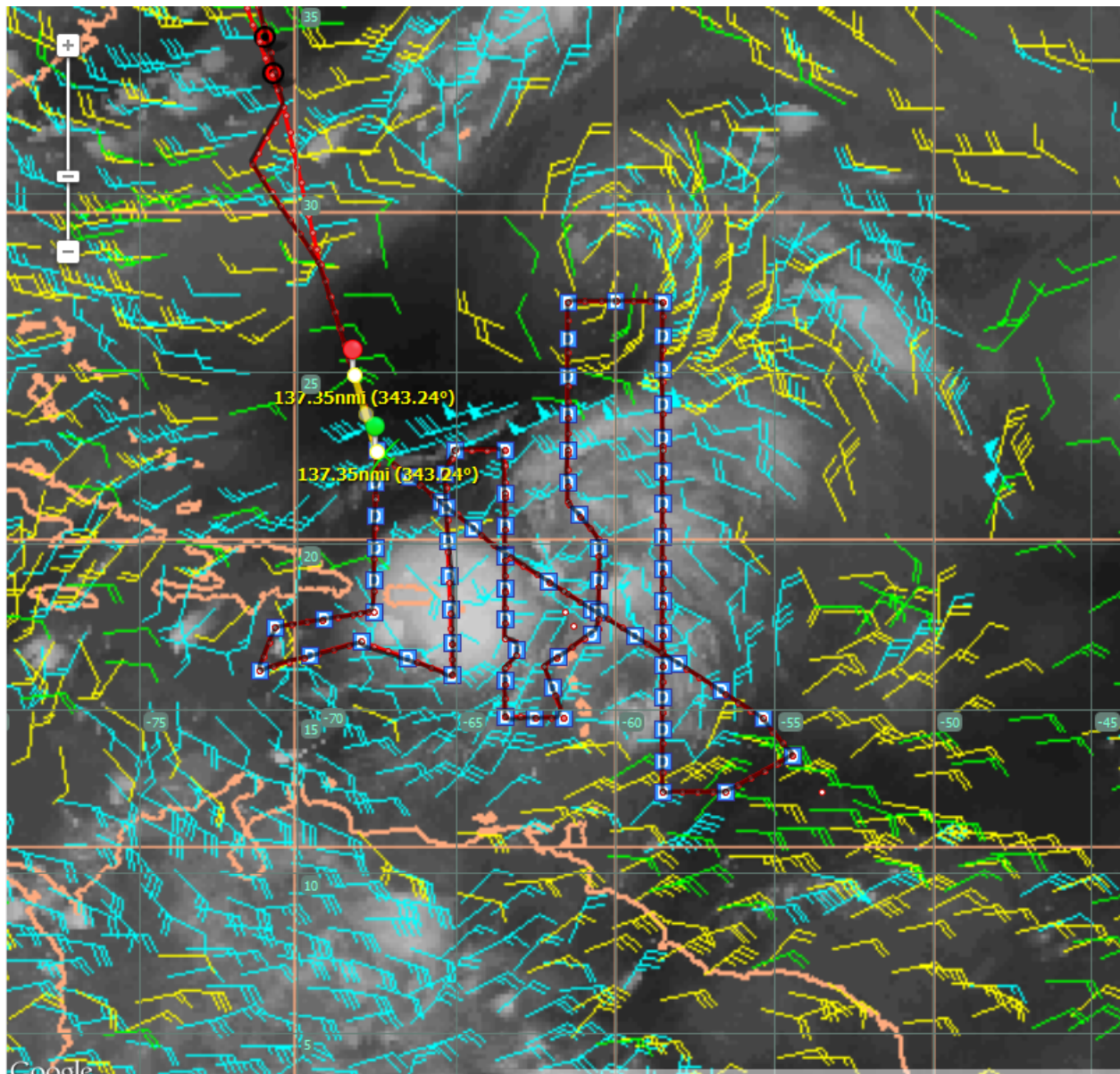
0925 Moving along on north side of Gabrielle. CPL showing cirrus layer near 50 kft and some hints of the lower clouds beneath.

0929 Drop location 72 (75<sup>th</sup> sonde) released—good data.

0934 Drop location 72A (76<sup>th</sup> sonde) released—good data.

0941 Drop location 73 (77<sup>th</sup> sonde) released—good data. New world record for dropsonde releases in a single mission.

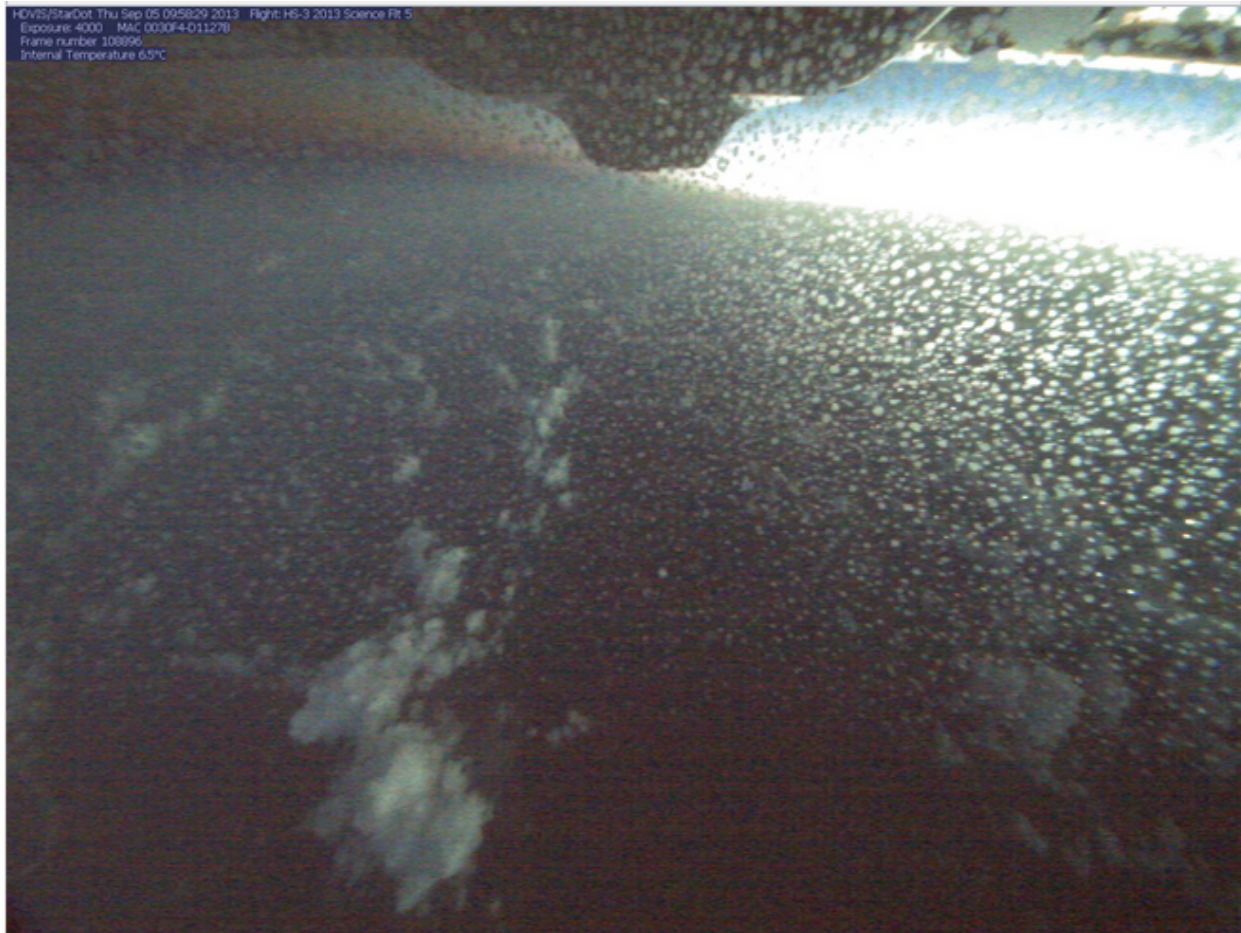
0947 Drop location 73A (78<sup>th</sup> sonde) released—good data.



Clear upper anticyclone over Gabriele, westerlies over the eastern convection. Upper cyclone north of the eastern system.

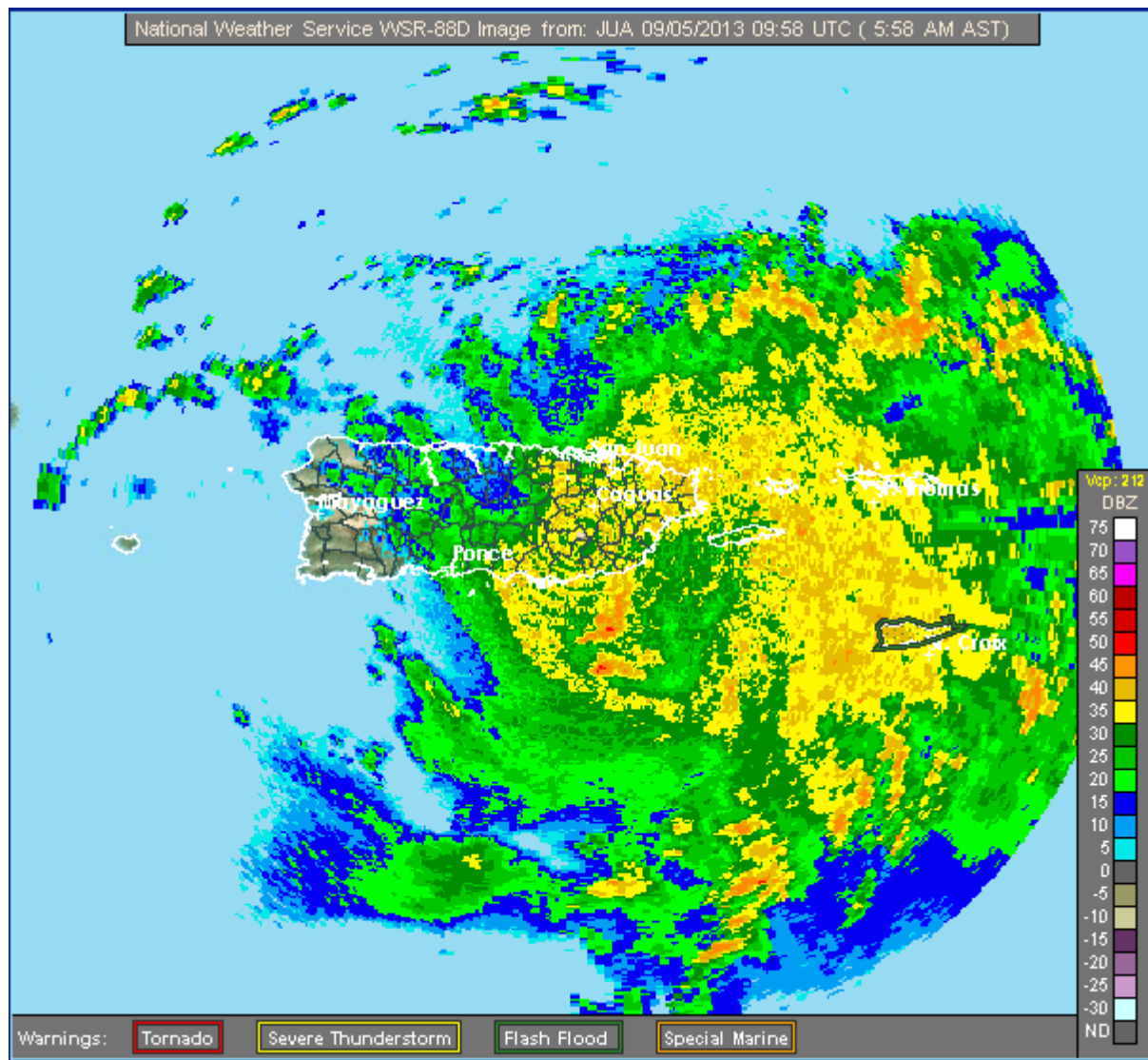
0954 Drop location 74 (79<sup>th</sup> sonde) released—good data.

Last drop will be about 137 nmi after the turn toward WFF. Located at red marker in the image above. Trying to target the area just north of the outflow.



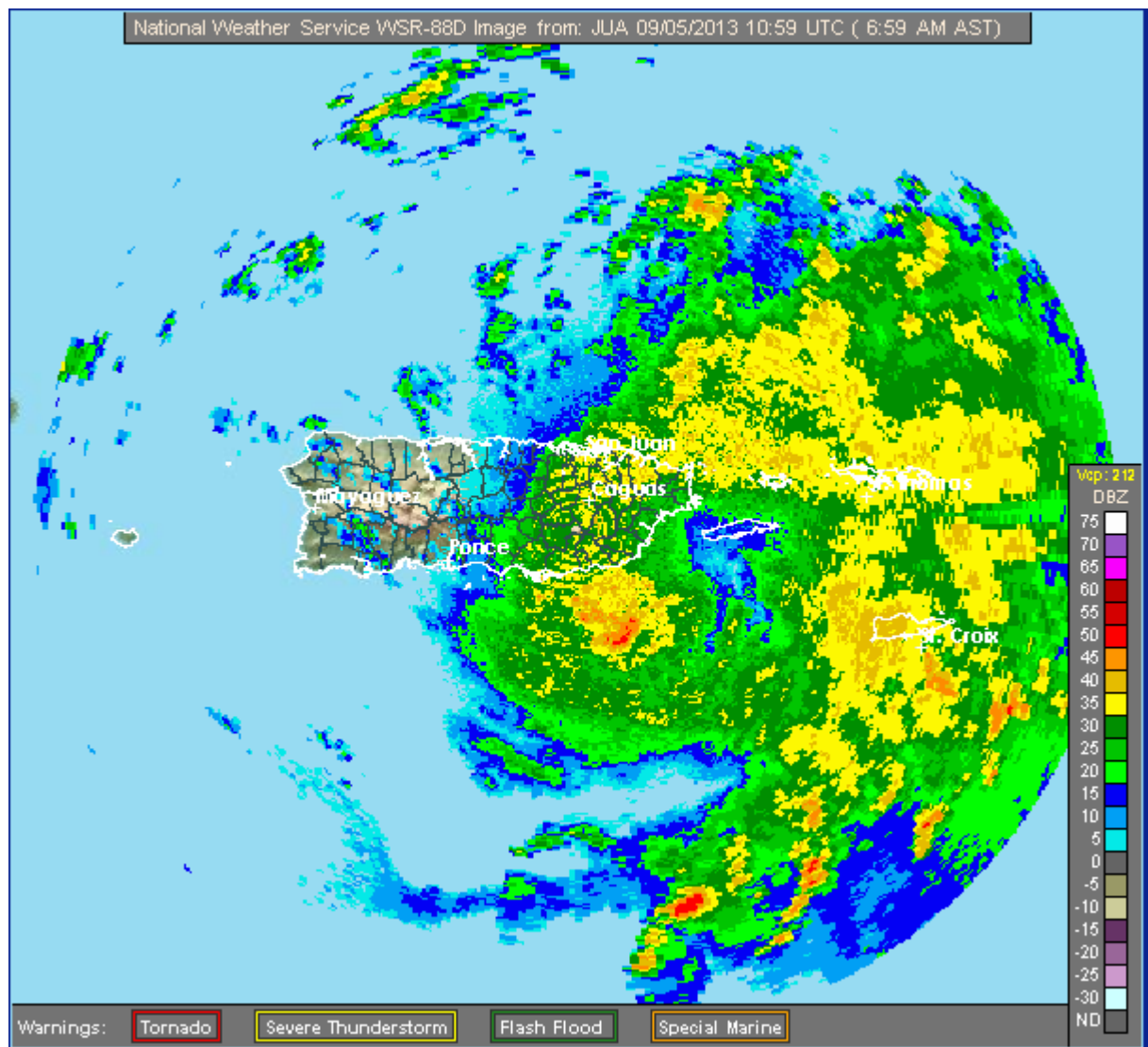
Good morning AV-6. HDVIS sees sunrise although lots of condensation on window.





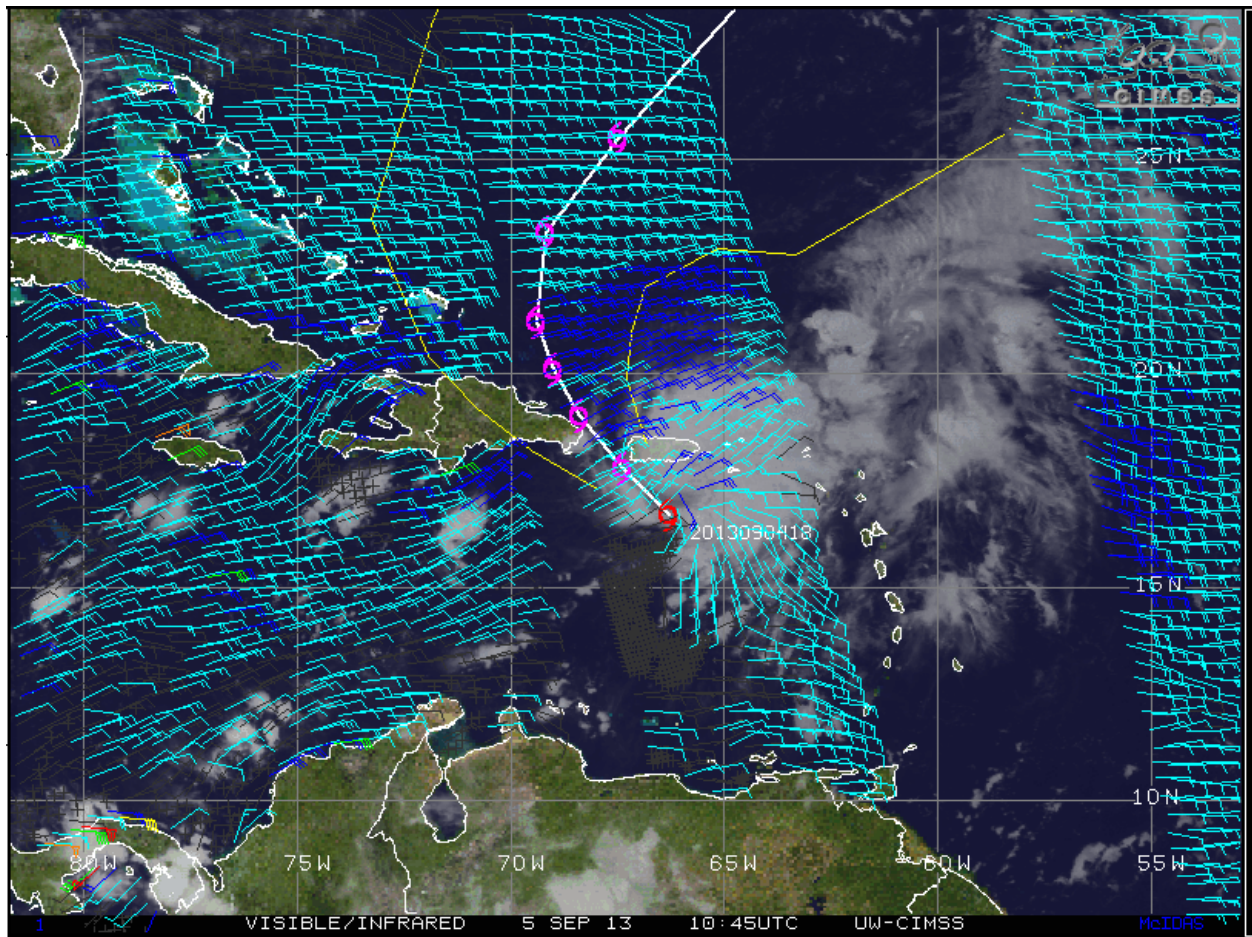
San Juan radar animation suggests a storm motion to the north toward the eastern side of Puerto Rico even though the official forecast has the storm moving by the western side of the island. The convective cells just south of eastern Puerto Rico appear in the animation to be on the east side or near the center of the circulation and are drifting northward with the system as a whole.

1017 Drop location 74A (80<sup>th</sup> sonde) released—good data. We are done doing drops.

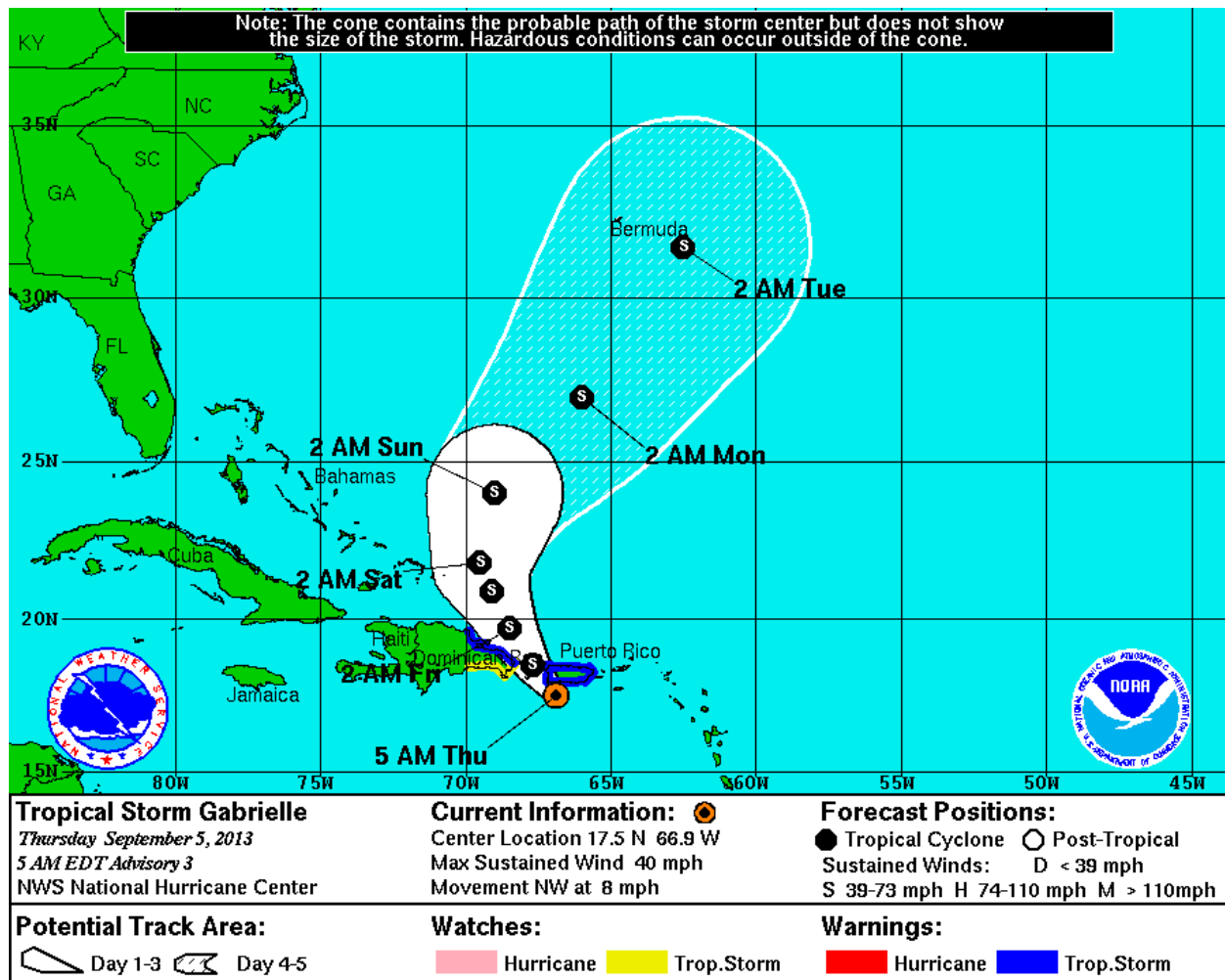


1059 UTC radar shows convection just southeast of the radar. There appears to be a low-level center near this convection since the convection is moving slightly northward while rain a bit to the west is moving southward. The rest of the convection has moved eastward to form a rainband. Animation actually suggests that the precip free region on the east end of the island may actually be becoming a larger-scale circulation center, perhaps at midlevels, compared to the smaller-scale circulation.



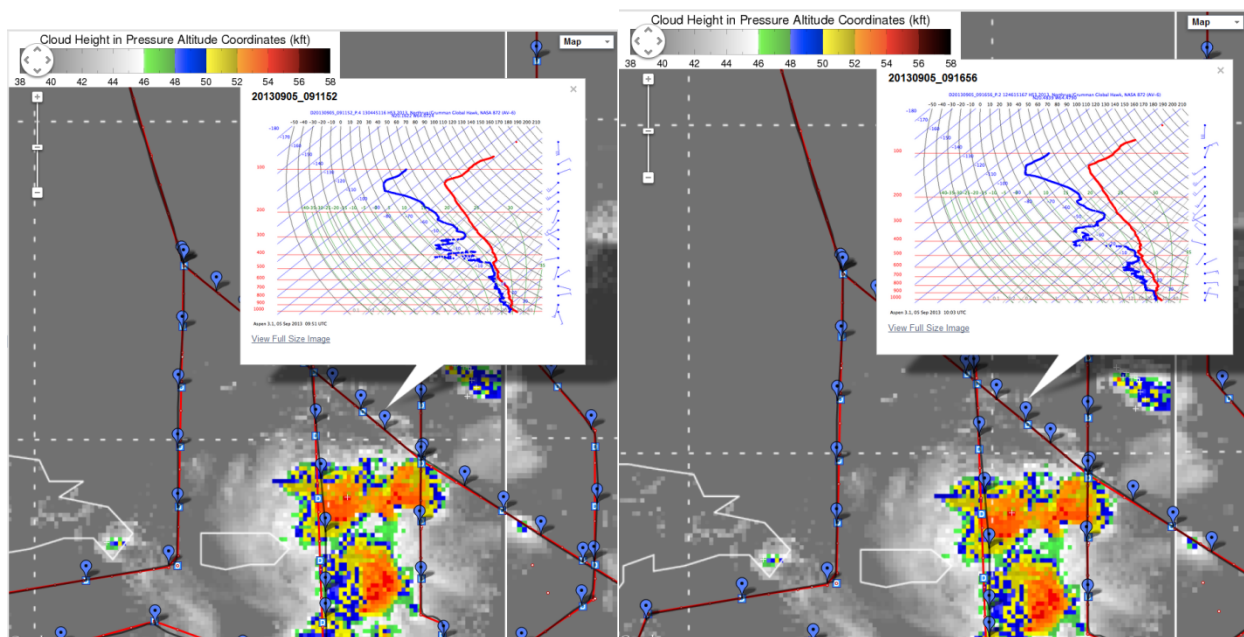
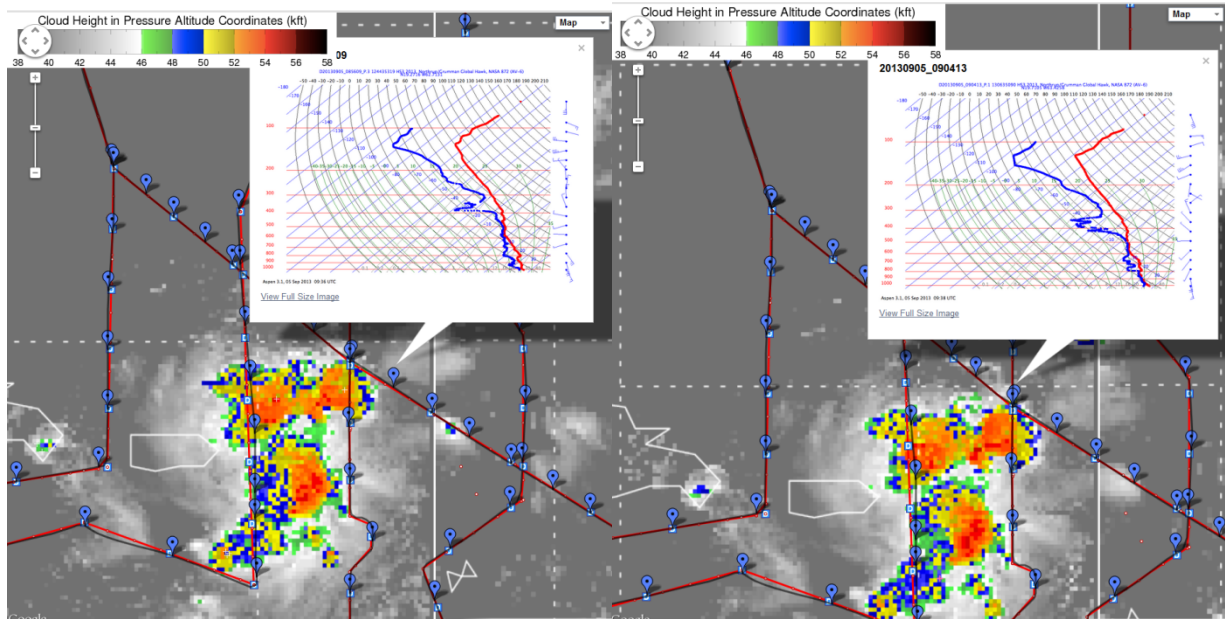


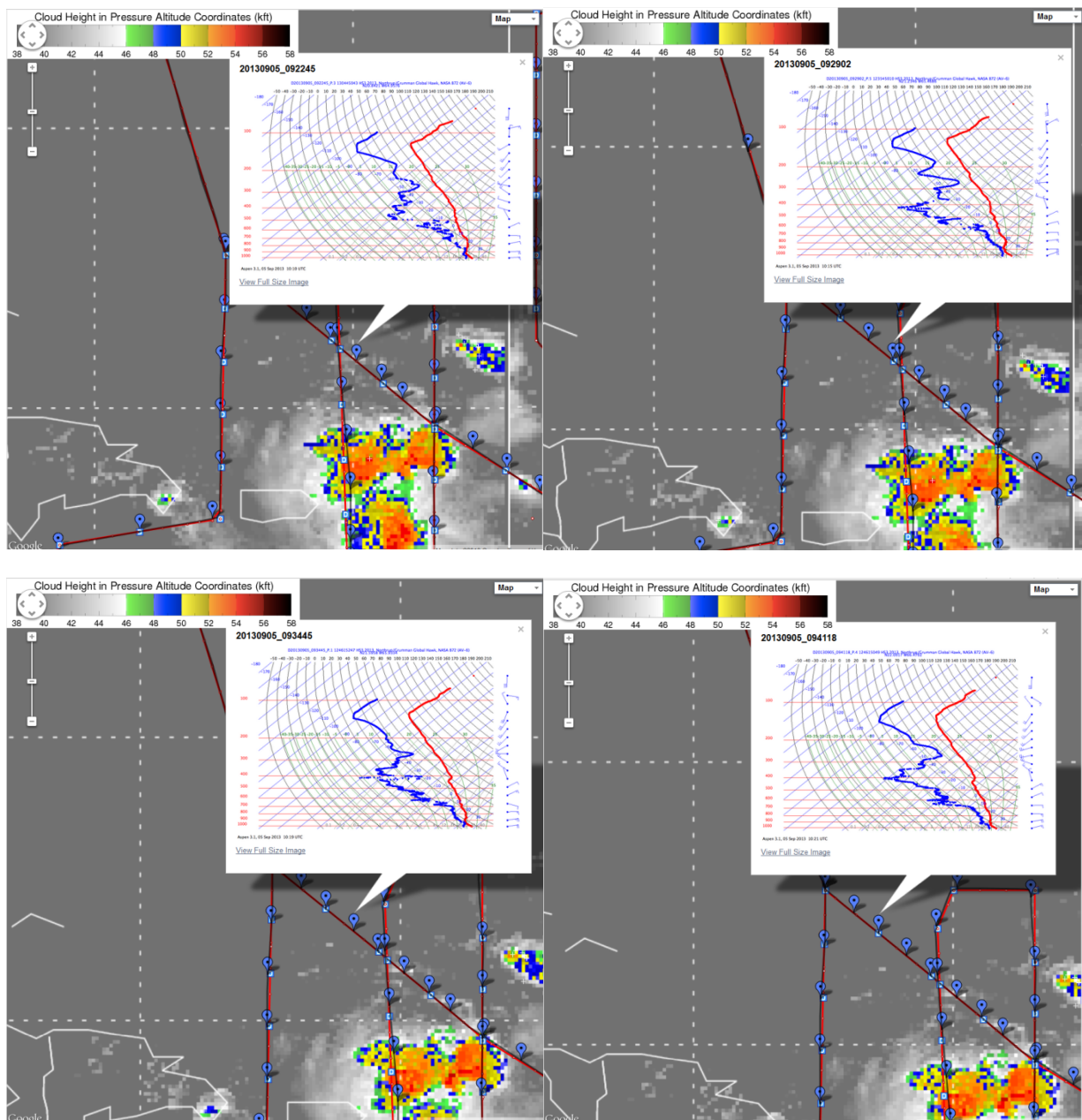
Above is the 1045 UTC GOES imagery with an ASCAT overpass directly over Gabrielle and OSCAT data to the west. ASCAT shows the sfc circulation matching up well with the NHC center location.



The NHC forecast and most of the dynamical models have the storm moving west of Puerto Rico rather than moving north on the eastern side of the island.

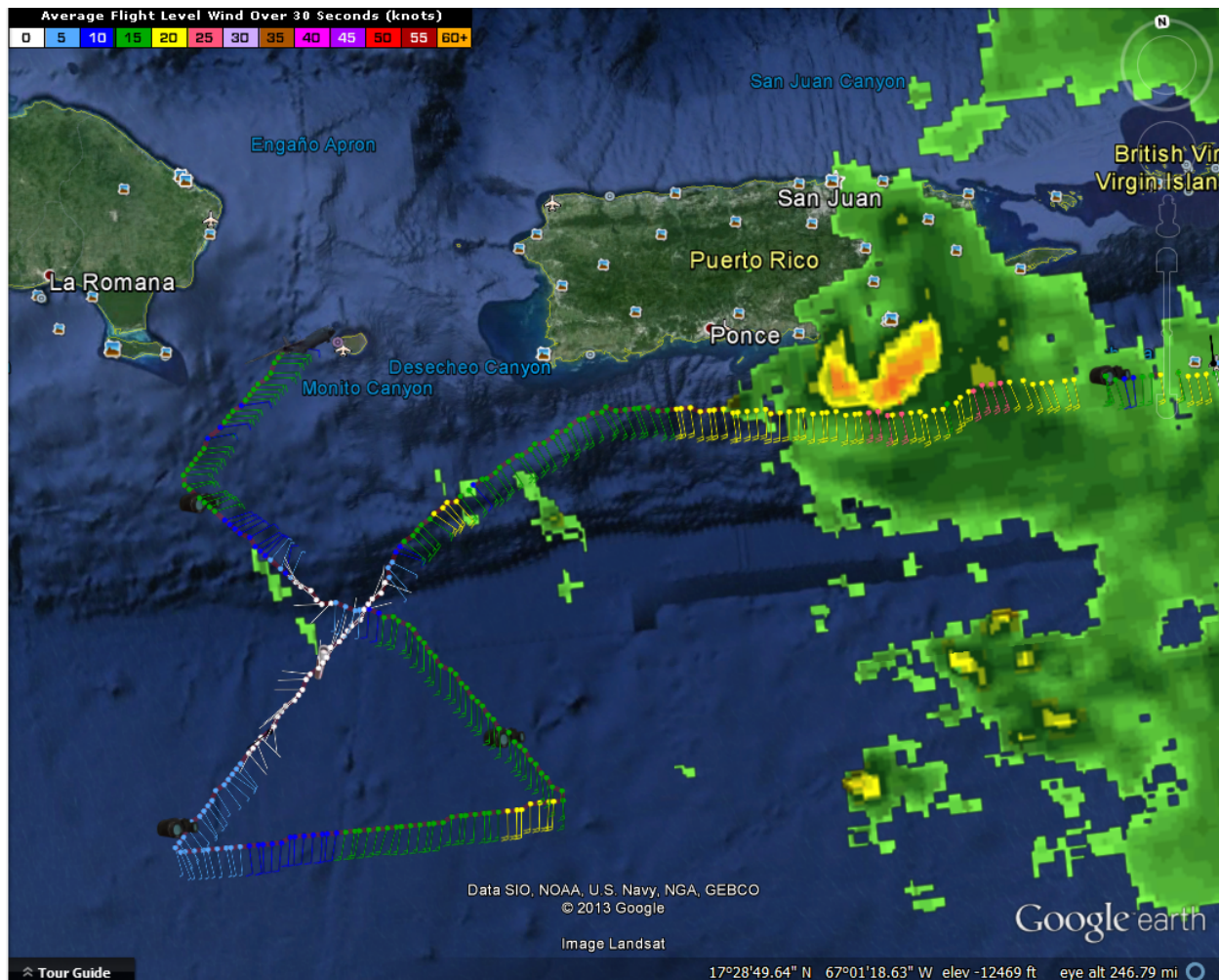
The following series of images shows the transition from moist to very dry conditions as we moved NWward along the final leg across the storm. The driest air starts in the 400-300 mb layer and then is at 400 mb when we encounter the deeper dry layer.





1130 AF C-130 took off toward Gabrielle again.





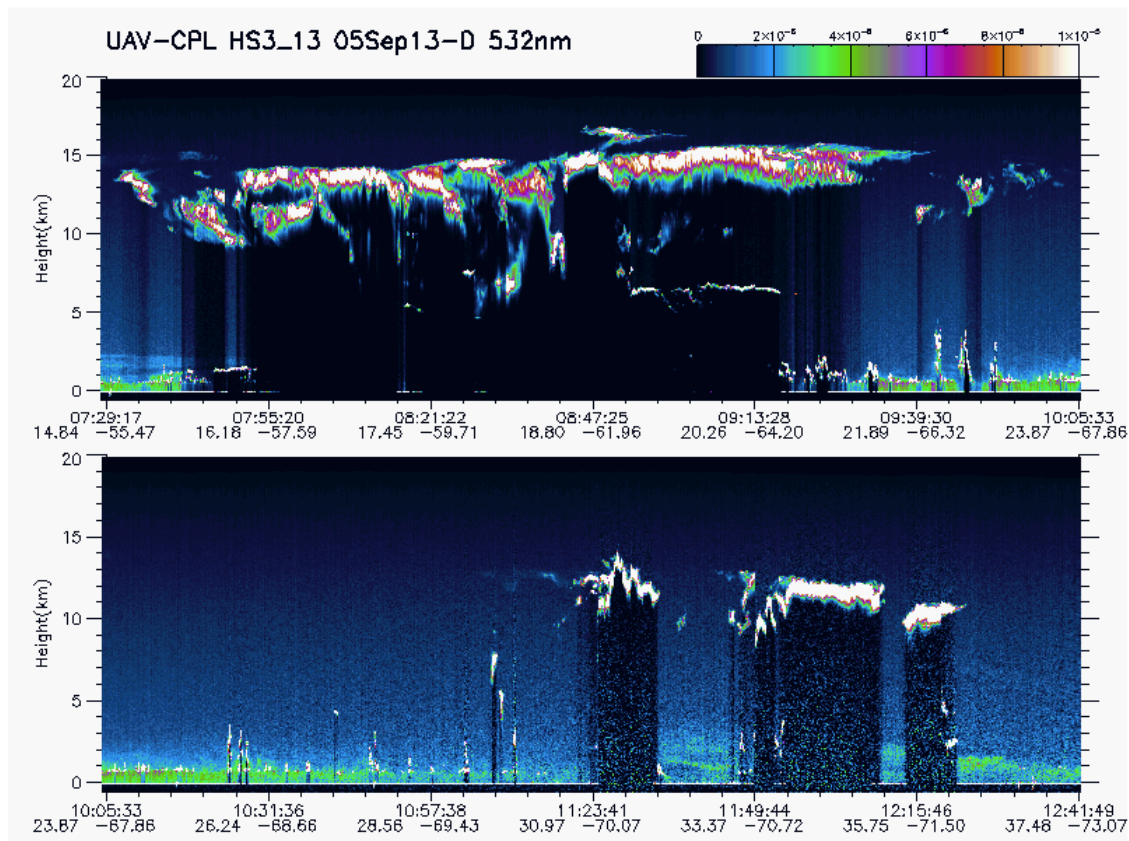
1415 Air Force recon shows 850 mb center south of Mona Passage, Pmin 1011 mb: 17.2N, 68.1W. Well displaced from mid-level convective and stratiform centers

1400 Landing

CPL summary

CPL performed nominally during the 4-5 Sept. 2013 Science flight. Laser energies, laser 532 signal strength, and temperatures were all very good. CPL sensed a variety of cloud tops and aerosols (see example below).





## AVAPS Summary

AVAPS successfully deployed 80 sondes during the flight, breaking our previous record of 76. A total of 84 had been loaded so we will be returning with 4 sondes. System performance was generally very good with only minor issues with data return. We experienced 3 fast falls and a 4th partial fast fall. A couple of other soundings experienced some missing data or did not transmit to the surface. One additional sounding was flagged with bad winds due to observed fluctuations in the data. Quality of the data appeared good and the data was utilized in real-time by NHC and cited in their published forecast discussions for Gabrielle.

A summary of the current dropsonde use and remaining supply is below.

### Sondes Dropped

Qty	Date	Flight
6	8-01-13	Range Flight
15	8-20-13	RF01
54	8-24-13	RF02
72	8-29-13	RF03
80	9-04-13	RF04

227 Total Deployed as of 9-04-2013

As of 9-05-2013

**Total Sondes available: 323** (550-227=323)

## S-HIS

S-HIS MTS products were unavailable Sept 4 1750 - 1924 UTC due to a network block placed on the S-HIS server at UW-Madison. Ku was intermittent during southern portion of flight leg around 0642 UTC. Complete S-HIS data will be available in post-processed products.

An anomalous S-HIS detector temperature rise was once again experienced on this flight. The detector temperature increased from its nominal value of 77K to 91 K by 0130 UTC (Sept 5). The detector temperature and instrument responsivity was closely monitored during the flight, and at 0145 UTC a power cycle of the S-HIS instrument was requested. The instrument was powered off for 17 minutes (goal: 15 minutes). The intent of this long power cycle was to 'reset' the cooler to nominal behavior. The on-duty Mission Scientist was consulted so that the timing of the power cycle did not impact critical science data. The instrument was powered back on at 0202 UTC, and the detector temperature and instrument responsivity returned to nominal values by 0224 UTC, and remained nominal for the remainder of the flight.

The increased detector temperature through 0130 UTC should have negligible effect on the quality of the science data for the flight, but we will review the processed data in further detail as soon as it's available to confirm this conclusion. We will continue to carefully monitor detector cooler performance for further degradation. A spare cooler is being prepared at UW-SSEC, but given the success of the cold restart of the cooler during this flight, a low risk option is to conduct cold restart earlier in the flight, perhaps prior to the start of science data.

There were a large number of high clouds and overshooting tops in the system, resulting in some interesting observations. SNPP and AQUA overpassed the system at roughly 0548 and 0549 UTC (Sept 5). The overpasses were roughly 285 and 150 nautical miles west of AV-6, respectively.

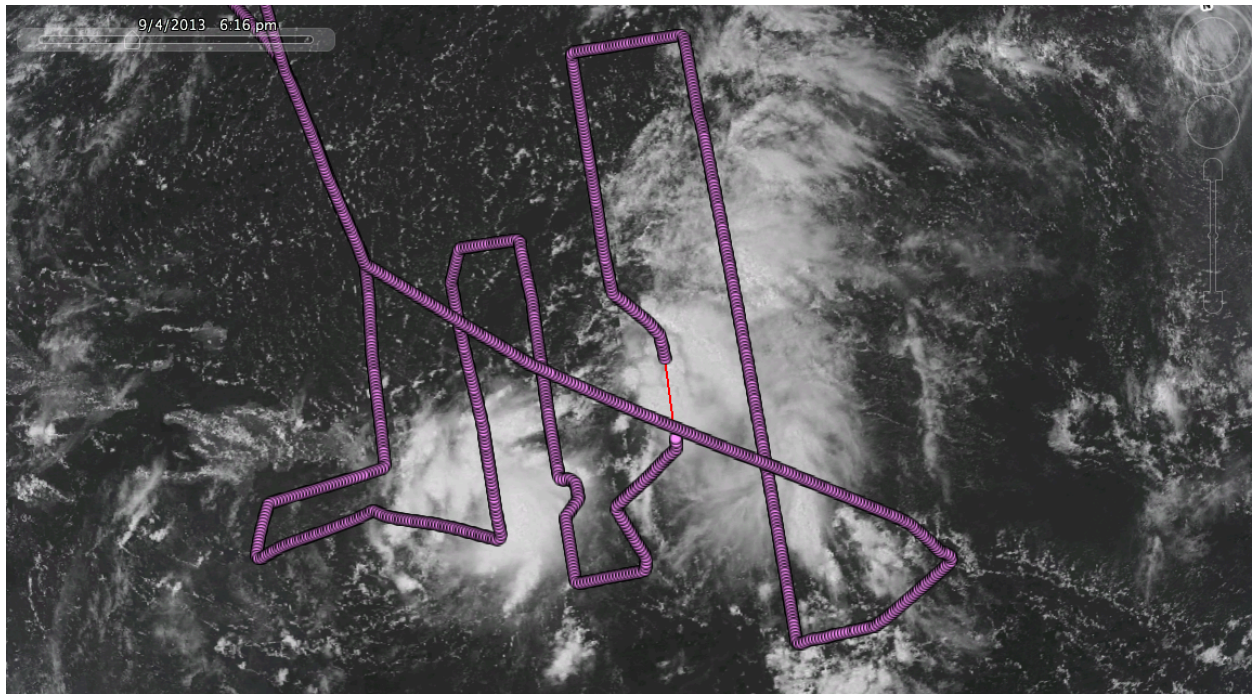


Figure 1: S-HIS power off from 20130905 0145 - 0202. Power off region indicated by red line. Detector temperature returned to nominal at 0224.

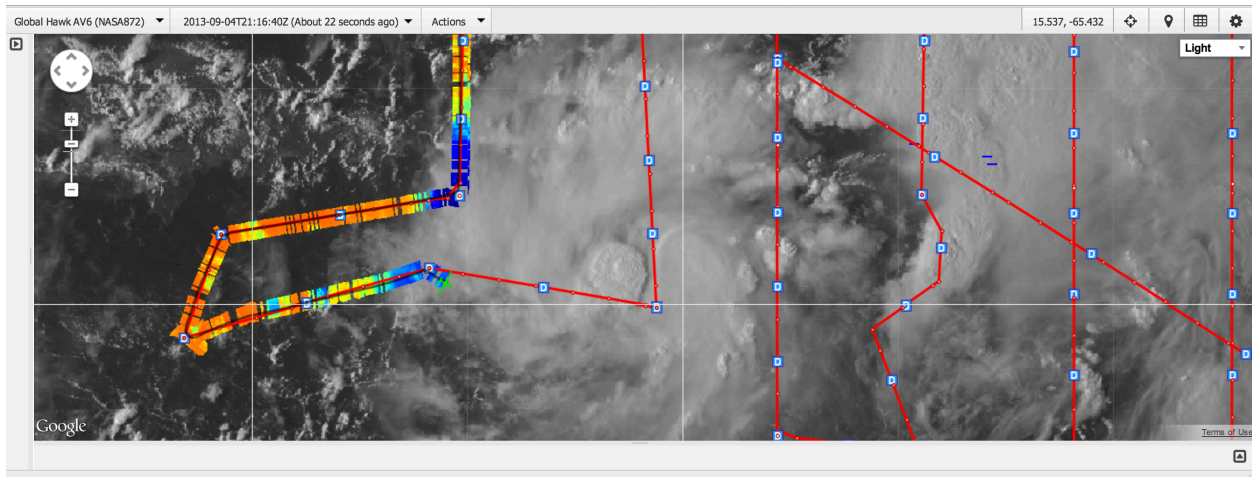


Figure 2: S-HIS 895-900  $\text{cm}^{-1}$  Brightness Temperature image overlaid on GOES IR.

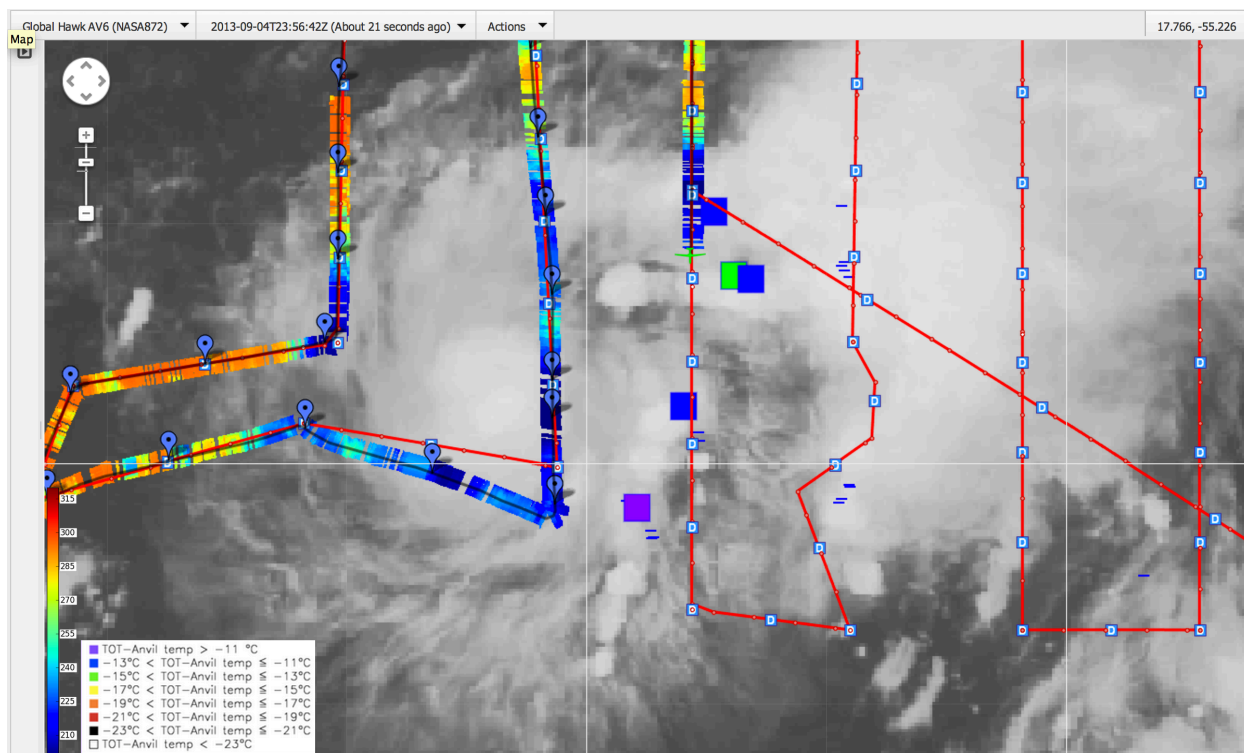


Figure 3: S-HIS 895-900  $\text{cm}^{-1}$  Brightness Temperature image overlaid on GOES IR. Overshooting tops and lightning indicated.

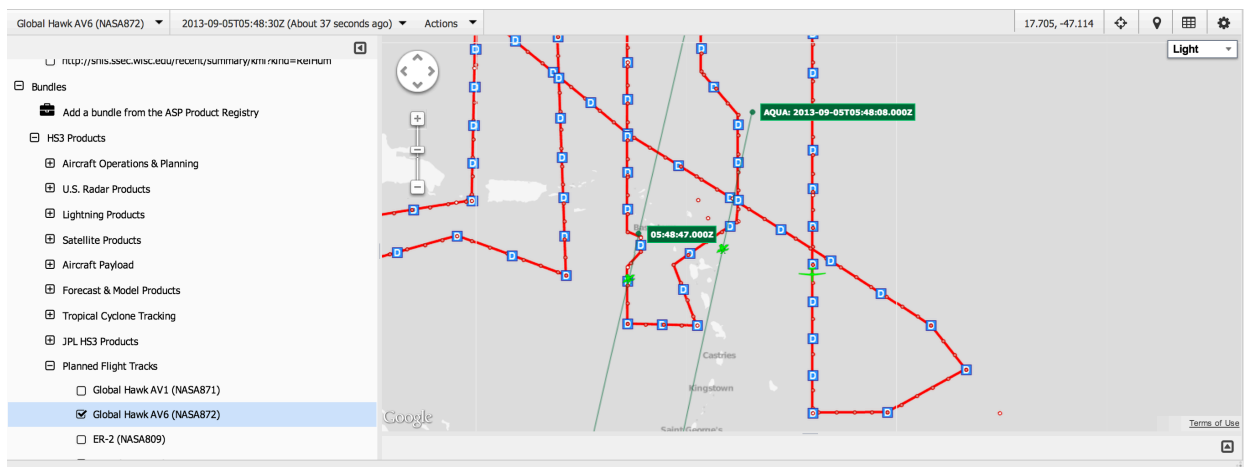


Figure 4: NPP and AQUA overpass over TS Gabrielle. The overpasses were roughly 285 (NPP) and 150 (AQUA) nautical miles west of AV-6 at the time of the satellite overpasses.



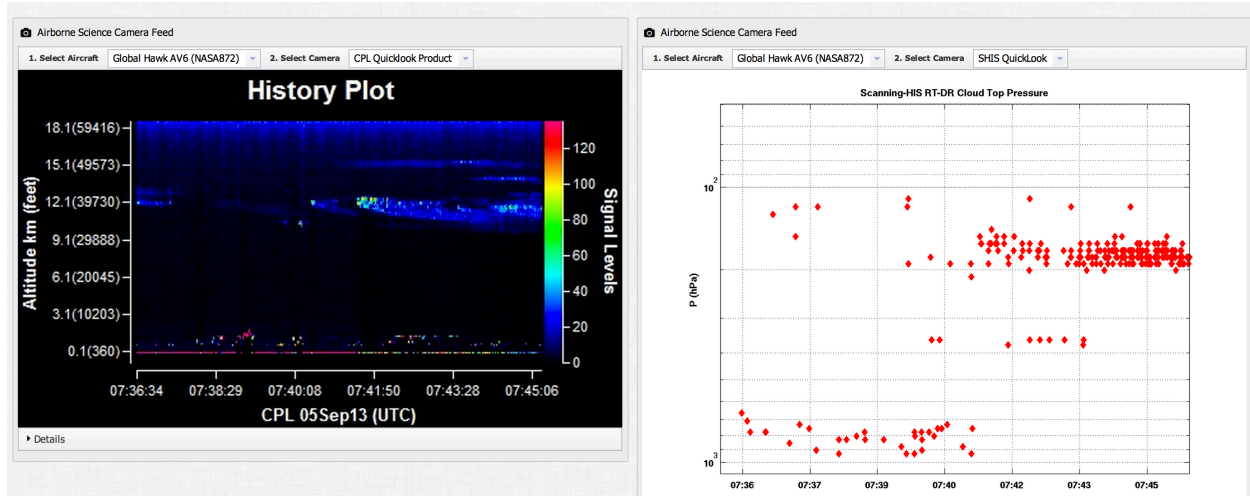


Figure 5: Comparison of CPL and S-HIS cloud top height products.

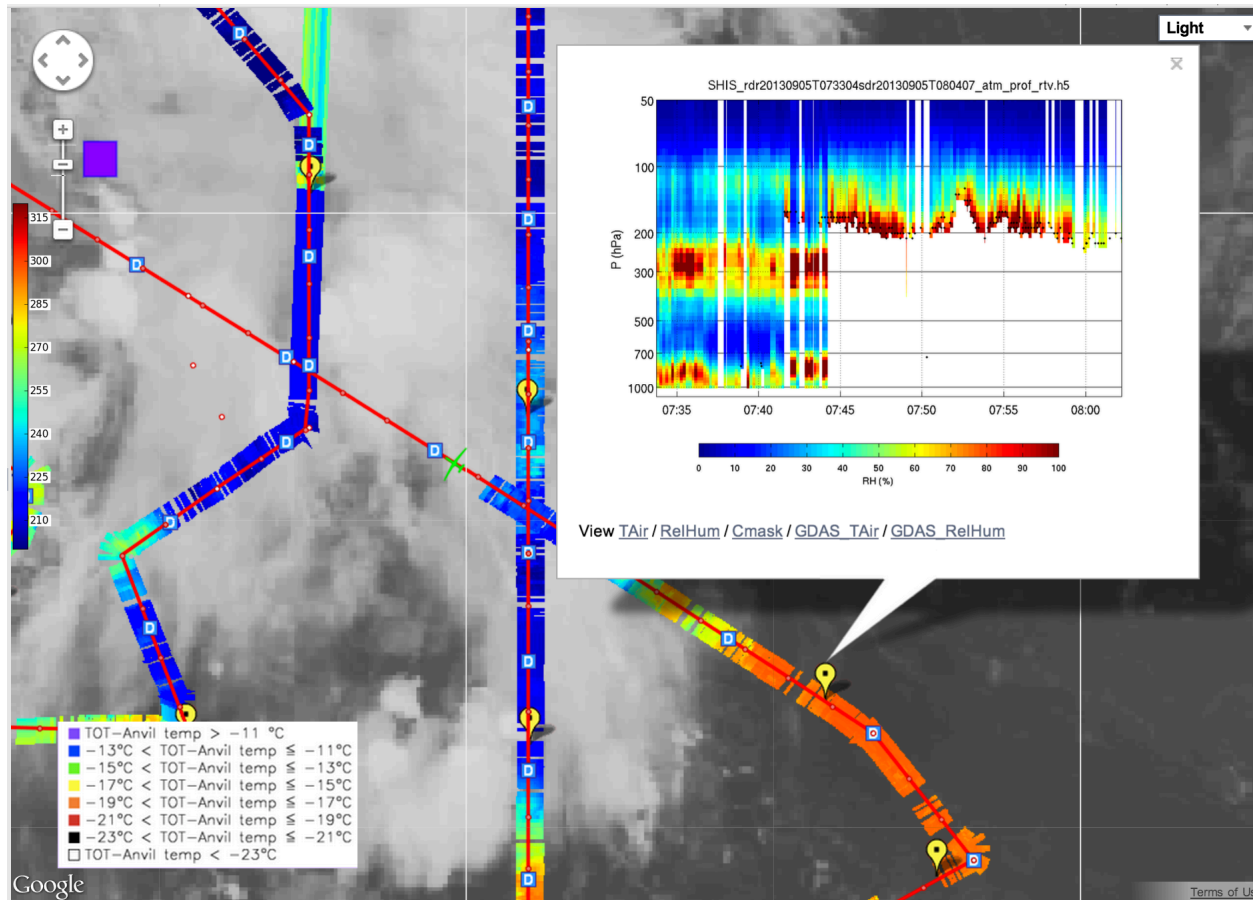


Figure 6: Corresponding 30 minute DR retrieval RH summary plot.



